REPORT

ON

THE ADMINISTRATION

OF

THE METEOROLOGICAL DEPARTMENT

OF

THE GOVERNMENT OF INDIA

IN

1907-08.

1. The department has to regret the death, which occurred on 18th March 1908, of Sir John Eliot, F. R. S., K. C. I. E., the late Meteorological Reporter to the Government of India and Director General of Indian Observatories. Sir John Eliot had been officially engaged from the time of his retirement in 1903 on the preparation of departmental records for publication in the form of Memoirs, and during the year he completed the publication of his analysis of winds at Rangoon, Chittagong, Allahabad and Lucknow. At the time of his death he had still in hand the preparation of several other Meteorological Memoirs and a "Handbook of the Meteorology of India" as a companion volume to the Climatological Atlas which appeared in 1906. Throughout the long term of seventeen years of his office as Meteorological Reporter to the Government of India, Sir John Eliot showed a wholehearted concern for the interests, usefulness and development of the department. A short account of his meteorological work in India was given in the Administration Report for 1903-04.

DEPARTMENTAL CHANGES DURING THE YEAR 1907-08.

Temporary changes in the staff.

2. Mr. J. Patterson, Imperial Meteorologist, returned from privilege combined with deputation leave extending in all to 2 months and 27 days (the deputation period being from the 16th May to the 6th June 1907), and took over charge of his duties on the forenoon of the 24th June 1907 from Mr. W. A. Bion, who had officiated for him during his absence.

3. Mr. J. H. Field, Imperial Meteorologist, proceeded on 13 days deputation combined with 2 months and 27 days privilege leave from 23rd August 1907, and returned to duty on the forenoon of the 2nd December 1907, relieving Mr. W. A. Bion, who had officiated for him during his absence.

4. Mr. C. Michie Smith, Director, Kodaikanal and Madras Observatories, returned from 3 months' privilege leave combined with 6 months' furlough (total 9 months) and took over charge of the Directorship on the forenoon of the 2nd January 1908, from Mr. J. Evershed, who had officiated for him during his absence.

5. Mr. R. Ll. Jones, Meteorologist, Madras, and Deputy Director of the Madras Observatory, proceeded on 14 months' furlough combined with and in continuation of the summer vacation (from 6th May until 8th July 1907), of the Presidency College, Madras; and Mr. R. Littlehailes, Professor of Mathematics in the Presidency College, Madras, was appointed to officiate for Mr. Jones during his absence.

OBSERVATORIES.

6. The observatories maintained by the Government of India are classified as follows :—

First Class.—Observatories which are furnished with autographic instruments for continuously recording pressure, temperature, humidity, and wind direction and velocity, in addition to instruments read by eye.

Second Class.—Observatories at which readings are taken daily at 8 hrs., 10 hrs. and 16 hrs.: those at 8 hrs. are (with a few exceptions) transmitted by telegram to one or more of the offices at Simla, Calcutta, Bombay or Madras for inclusion in the India or provincial Daily Weather Reports.

Third Class.—Observatories—

(*a*) where readings are taken daily at 8 hrs. only; in those stations where there are telegraph offices the observations are transmitted by telegram for inclusion in the Simla, Calcutta, Bombay or Madras Daily Weather Reports;

(*b*) at stations where there are no telegraph offices, and observations are recorded at 10 hrs. and 16 hrs. only; these are included in the Monthly Weather Reviews, and furnish a series of observations for the determination of monthly and daily means which should be comparable with the means already obtained for second class observatories.

Fourth Class.—Observatories at which observations of temperature, wind and rainfall only, or of temperature and rainfall only, are recorded.

7. At the commencement of the year 265 observatories contributed registers of meteorological data; of these 46 were non-departmental and 219 were maintained by the Government of India. At the end of the year the total number of observatories was 272, of which 49 were non-departmental and 223 were maintained by the Government of India.

Of the 223 departmental observatories, 7 were first class, 22 second class, 174 third class and 20 fourth class.

8. The changes in non-departmental observatories during the year were the following :—

(*1*) 4th class observatories were opened (1) at Birjand (in Persia) on the 1st April 1907, under the superintendence of the officer on special duty in Eastern Persia; (2) at Kermanshah (in Persia) on the 1st January 1908 under the superintendence of His Britannic Majesty's Consul; and (3) at Kargil (in Kashmir) on the 1st January 1908, under the superintendence of the Meteorological Reporter, Jammu and Kashmir State, Srinagar.

(*2*) The observatories at Ambala and Meshed were changed from non-departmental to departmental on the 1st April 1907, and 1st June 1907, respectively.

(*3*) The observatories at Chitaldroog and Hassan were changed from 2nd to 3rd class on the 1st and 18th August 1907, respectively.

(*4*) Arrangements were made for recording and wiring to Simla the observations at 7 hrs. from Colombo and Trincomalee (from 6th and 7th March 1908, respectively), instead of at 8 hrs. as was previously done, and the observer at each of the stations was granted an allowance of Rs. 5 per month from the department on account of the change.

9. The following were the changes in departmental observatories during the year :—

(*1*) A third class observatory was opened at Monghyr on the 10th April 1907 and another on the 15th October 1907 at Kerman, Persia, under the superintendence of His Britannic Majesty's Consul at that station.

(*2*) The observatories at the following stations were changed from 2nd to 3rd class :—

(*a*) Ludhiana, Khandwa, Roorkee, Karwar, Peshawar, Jacobabad, Hazaribagh, Waltair, Salem, Bellary, Deesa, Sholapur and Akola on the 1st July 1907.

(*b*) Diamond Island, Saugor Island, Chittagong, False Point and Akyab on the 1st March 1908.

(*3*) The observatory at Buldana was changed from 3rd (*b*) to 3rd (*a*) class on the 1st January 1908.

10. Observations were received from D'thala, Mauritius, Beirut, Singapur and Penang. (These are not included in the total number of stations in paragraph 6.) Meteorological instruments were supplied to Gartok, Ahwaz Shiraz, Turbat-i-Haidari, Kotgarh and Goona.

11. Owing to the difficulty of checking effectively the 10 h. and 16 h. observations from 2nd class observatories, which were few in number and by many years of work had afforded fairly completely the information required from them, it was decided to reduce all second class observatories to 3rd class with the exception of those at hill stations, the observations of which are required for the investigation of the upper atmosphere, and those at the chief towns of their districts which are retained for climatological purposes. It was in accordance with this policy that the changes given in detail in paragraph 9 (2) (*a*)and (*b*) above were made.

First Class Observatories.

12. The Directors of the Government Observatories of Kodaikanal, Madras and Bombay publish separate annual reports which are forwarded through the Department for the information of Government. It has accordingly been ruled that it is unnecessary to include information relating to the working of these observatories in the present Administration Report.

13. *The Alipore Observatory.*—This observatory is under the charge of the Meteorologist, Calcutta. It is furnished with a complete set of autographic instruments, including a Whipple-Casella sunshine recorder, a Callendar sunshine recorder, a Bergholz barograph, a Kew barograph, a Kew thermograph, a Richard thermograph, a Beckley anemograph, a Dines pressure-tube anemometer, a Beckley rain-gauge, a Michie Smith monthly rain-gauge, a Mascart self-registering electrometer and a Milne horizontal pendulum seismograph.

These instruments have on the whole worked satisfactorily during the past year, except the Callendar sunshine recorder, which was out of order.

14. All instruments issued by the Meteorological Department are tested at this observatory and their corrections ascertained before they are sent out for use. The number of instruments tested and verified during the year was 503 as compared with 589 last year. Thirty-three instruments were condemned as unfit for issue or were rapaired by the Mathematical Instrument Department or the Departmental Mechanic and twenty-two instruments were kept in store for future treatment.

15. The observatory gives mean Calcutta time to the port and shipping. Three time balls are dropped daily at 1 P.M. local mean time throughout the year, one on the Semaphore Tower at Fort William, the second at the Port Commissioners' office and the third at the Kidderpore Docks.

This work was carried out satisfactorily on the whole. There were 10 failures as compared with the average number 11·6 of the past nineteen years ;

in all cases they were due to faulty behaviour of the electric or mechanical arrangements outside the observatory.

Year.	Number of days on which one or other ball failed to drop properly.	Number of failures due to telegraphic defects.
1907-1908	10	10
1906-1907	25	24
1905-1906	11	11
1904-1905	3	3
1903-1904	20	20
1902-1903	14	14
1901-1902	13	13
1900-1901	15	15
1899-1900	13	13
1898-1899	6	6
Mean of ten years, 1888-98	10	10

16. *The Allahabad Observatory.*—This observatory is under the charge of the Meteorologist, Allahabad. The self-recording instruments in use at the observatory were:—(1) a Beckley anemograph; (2) Two Dines pressure tube anemometers situated on the top of a tower at a height of 55 feet above the ground level; (3) a Richard barograph; (4) a Richard thermograph (giving both wet and dry bulb records); (5) a Draper thermograph (dry bulb only); and (6) a Stokes sunshine recorder.

There were also in use at the observatory (1) three solar radiation thermometers; (2) a grass thermometer for measuring terrestrial radiation; (3) one ground thermometer placed on the surface; (4) the ordinary complement of instruments for eye observations of atmospheric pressure, temperature, vapour pressure, humidity, cloud, wind and rainfall; (5) six barometers for purposes of comparison and for use in the inspection of observatories; (6) a Marie Davy and a Duboscq nephoscope; (7) and a full set of ordinary thermometers in a second cage for purposes of comparison.

Beckley anemograph.—The instrument seems to have worked well throughout the year, except on seven occasions when short breaks occurred in the trace, and on one occasion when the instrument was under repair for a week.

Dines pressure anemometer.—There are two instruments in work, both of which gave good tracings but there is some difference between the simultaneous values of wind pressure recorded by them; they are however still under experiment.

Richard barograph.—This instrument gave excellent tracings throughout the year. All the charts have been tabulated.

Richard thermograph.—The wet bulb tracings of the thermograph have not been very satisfactory, but the dry bulb tracings, with a few exceptions, have been good.

Draper thermograph.—Observations with this instrument were permanently discontinued on the 19th September.

Sunshine recorder.—This gave good results without a break.

Nephoscope.—Regular observations of clouds have been made with the large Marie Davy and Duboscq instruments.

Readings of all the eye instruments were taken every two hours, from 6 h. to 22 h. The earth thermometer on the surface was read at 6, 14 and 22 h. Special observations for use in storm warnings were made when they were called for by the Simla office.

17. *The Lahore Observatory.*—Eye observations of the ordinary meteorological instruments were taken seven times daily at this observatory as in past years; that is at 6, 8, 10, 14, 16, 18 and 22 h. Ground surface temperature was recorded four times daily, *viz.*, 6, 10, 16 and 22 h.

The observatory is furnished with the following automatic instruments which have worked satisfactorily during the year:—

(1) Draper barograph; (2) Richard barograph; (3) Casella self-recording rain-gauge; (4) Beckley anemograph; (5) sunshine recorder.

Besides the above instruments there are in use at the observatory three maximum solar radiation thermometers, one ordinary sun thermometer (not self-registering), and one grass radiation thermometer.

A large number of special temperature readings was taken from thermometers in the shed and Stevenson screens to find the difference between the two forms of exposure. Also a number of wet bulb readings was made with different arrangements of the wet threads to find the effect of excessive or defective water-supply on the wet bulb temperatures.

Character of the work of observation at Second and Third Class Observatories.

18. The general character of the work of the observatories judged by the number of mistakes made by observers does not appear so satisfactory this year as during the previous year. The number of stations of great reliability in which either no mistake or only one has been detected in the data for the Indian Daily Weather Report was only 14 as against 22 last year, while the number of stations at which more than 50 mistakes were made increased from 6 to 24.

This large increase in mistakes was not due to unsatisfactory observing but to a change in the method of counting mistakes. In previous years it had been the custom not to count an observation wrong if it was wrongly telegraphed, but correct in the E register; during the year a change was made by which all observations which were wrongly telegraphed whether right or wrong in the E register were counted as mistakes; that the observations themselves were satisfactory is shown by the fact that at only five stations were more than fifty mistakes made in the observations.

The usual list showing the number of observations rejected, and also the number of telegrams incorrectly prepared, for all the observatories which send weather telegrams to the Simla office, was prepared and circulated to the observatories at the end of the year under review.

Inspection of Observatories.

19. The number of visits paid to observatories during the year was 72 as compared with 85 in the previous year and an average of 78 during the past eight years.

The Director-General inspected the observatories at Calcutta, Bombay, Madras and Kodaikanal. Mr. Patterson inspected thirteen stations mainly in northwest India. Dr. Simpson inspected eleven stations in Burma and one on the east coast of India. Mr. Bion inspected two, Mr. Gaetane twenty-four, Lala Hem Raj four, Ganesh Sadashiv three and C. C. Mudaliar eight.

One observatory was inspected twice so that the actual number visited was 71: of these 43 were reported as good, 18 as tolerable and 10 as bad.

The corresponding numbers last year were 68, 6 and 5.

Condition.	Number of observatories inspected in						
	1907-1908.	1906-1907.	1905-1906.	1904-1905.	1903-1904.	1902-1903.	1901-1902.
Good or satisfactory ...	43	68	48	58	45	55	61
Tolerable	18	6	13	13	22	21	12
Bad	10	5	4	5	2	10	9
Total ...	71	79	65	76	69	86	82

20. It is desirable that there should be more frequent inspection of observatories, especially those established in connection with hospitals, dispensaries and post offices, on account of the changes of observers at short intervals necessitated by acting and other arrangements in the Medical, Telegraphic and Postal Departments.

Special Observations.

21. Observations other than those recorded at regular intervals are made as follows:—

(*a*) In response to requests from the Simla or Calcutta office when weather is disturbed and storm warnings may have to be issued: such observations are always sent by telegraph. Certain observers at coast observatories are in receipt of a regular monthly allowance of Rs. 5 for sending special storm warning telegrams, while other observers receive an allowance of Re. 1 for each set of special observations sent at the request of either Simla or Calcutta. The number of telegrams of the latter class forwarded during this year was 933 as compared with 817 last year.

(*b*) Certain observers have been empowered, when they consider that conditions at sea are sufficiently threatening, to send of their own initiative to Simla or Calcutta a telegram containing special observations. No occasion of this type occurred.

(*c*) In connection with flood warning a number of observers have been instructed to send telegrams announcing the occurrence of heavy rainfall to Government officers and railway engineers who desire early information. The number of telegrams so sent was 49 as compared with 87 last year.

(*d*) After earthquakes, observers are instructed to send information in as definite a form as is possible: 4 reports were sent during the year.

Observations with Special Meteorological Instruments.

22. The following special observations were carried out during the past year at certain selected stations:—

1st.—Wind observations recorded by Beckley anemographs at 17 stations and by Dines pressure tube anemometers at five stations.

2nd.—Solar and terrestrial radiation observations at twelve stations.

3rd.—Underground temperature observations at 3 stations.

4th.—Sunshine observations at 10 stations.

5th.—Barometric observations recorded by self-registering instruments, chiefly Richard barographs, at 41 stations.

6th.—At the beginning of the year 37 thermographs were in use, but during the year 20 of these were withdrawn as it was considered that sufficient data had

been obtained from these instruments. Two instruments were out of order during the greater part of the year.

Observations of Solar energy in absolute units.

23. Observations were taken at Simla throughout the year when weather conditions allowed, by means of Angstrom's Electric Pyrheliometer.

Work with baloons and Kites.

24. Work with balloons and kites was actively continued. Kites carrying instruments were flown in July and August at Belgaum, where heights of about $2\frac{1}{2}$ miles above sea level were reached, and in August and September over the Bay of Bengal and Arabian Sea, where kites rose to nearly 2 miles above the ship. The instrumental records of temperature and humidity were under preparation for press at the end of the year.

Observation baloons of gutta percha tissue were liberated from Simla as in previous years, but with certain improvements in detail, and their courses and velocities were traced by theodolites.

Considerable advances were made in the development of light recording apparatus for balloon work over the plains of India and of very light balloons to carry them; and experiments were conducted in Lahore in February as a preliminary step to work in the Punjab further to the west, where some series of high ascents were then being arranged for. This balloon work differs from that which has for some years been carried on in Simla, in that the information required from it is given by instruments carried by the baloon itself, and is thus only obtainable in cases where the instruments can be retrieved. The method is an important one, and had been kept in view for India for some years, but as a large proportion of the balloons and instruments would never be recovered after descending it was not possible to adopt it until a sufficiently cheap instrument had been devised and arrangements made for its manufacture.

Seismograph Observations.

25. Seismological observations were recorded by means of Milne's self-registering seismographs during the year, as in previous years, at Alipore (Calcutta), Kodaikanal and Colaba (Bombay), and by means of other self-registering instruments at the last named station. All the instruments worked satisfactorily throughout the year, and copies of the records of the Milne's seismographs were regularly transmitted to the Seismological Committee of the British Association.

At Simla also there is a seismograph, of Omori-Ewing pattern; this has been in use throughout the year and records of the severe earthquakes which have occurred throughout the world during the year have been obtained with it.

Atmospheric Electricity.

26. During the greater part of the year a nearly continuous record was obtained in Simla of the electrical potential gradient in the atmosphere by means of a Benndorf self-registering electrometer. Arrangements were made for an investigation into the electrical condition of rain and a small hut was prepared to house the apparatus; but the monsoon came to an end before the apparatus was ready, and the actual observations had to be postponed until the following rains.

Marine Meteorology.

27. No significant change was made during the year under review in the collection of marine information.

At Calcutta and Bombay a clerk at each port spends his whole time in visiting ships, making in each case a copy of the log and a comparison of the ship's barometer with a secondary standard for the purpose of applying the necessary corrections to the readings of the logs; and after the barometer

comparisons have been tabulated in the Calcutta or Bombay office a statement of the error of the ship's barometer is posted to the captain in case he should desire to make use of it. The number of ships visited is materially less than that of the vessels which come into port but it is ample for our purposes.

The data thus obtained are utilised in the preparation of charts of disturbances in the Bay of Bengal and the Arabian Sea for future reference in connection with the storm warning work of the department; and for drawing up an account of the storms of the year for publication in the Annual Summary.

28. The arrangements made with the London Meteorological Office, the Royal Alfred Observatory Mauritius, the Weather Bureau Washington, and the Deutsche Seewarte Hamburg, for collecting marine data from the whole of the Indian Ocean (see last year's report) has been continued and the thanks of this department are again due to these four offices for supplying such a large amount of useful data.

29. The issue of pilot charts giving, month by month, the normal meteorological conditions over the Indian seas and the Indian Ocean as far south as Lat. 12° S., was continued. These charts show the mean pressure, the mean direction and force of the wind, the mean surface currents and the ordinary tracks of storms in the month under review, together with a brief synopsis of the normal conditions of the month. The chart for each month was issued about the 15th of the month preceding the period to which it referred. The charge for each copy was four annas as before. The total monthly issue amounted to about 200 copies.

As stated last year it had been decided to alter the method of publication of these charts and instead of issuing them month by month, with annual repetition, to publish a small atlas containing the twelve monthly charts of normal conditions and such additional charts of special conditions as might be thought desirable in order to make the atlas as useful as possible. The calculation of the necessary data and the preparation of the charts had been completed during the year 1905-06 and the results were sent to Messrs. Bartholomew of Edinburgh, for publication.

Owing to the preparation of the atlas taking longer than was expected publication did not take place during the year under review, but final proofs had been corrected and returned before the end of March.

30. Observations recorded during the year at the entrance to the River Hooghly were supplied to the Meteorological Department by the Light Vessels Cornet, Torch, Hesperus and Luna and by the dredger Sandpiper.

Snowfall Registration in the Mountain Districts to the North and West of India.

31. The information as to the amount, distribution and time of occurrence of the snowfall in the Himalayan and Afghan mountain areas for the cold weather of 1907-08 was on the whole tolerably complete and the thanks of the Department are again due to the various officers who have collected and forwarded it. The difficulty has again been felt that while the reports provided may represent faithfully the impressions of subordinate officers, they cannot be relied upon for that accurate comparison of one year with another which is desirable in the interest of climatic study. Important and reliable additions to the information have been obtained by continuing the series of large-scale photographs of the snows as seen from Simla which had been started in 1905.

Rainfall Registration.

32. No change was made in the system of rainfall registration during the year under review. A full account of the methods employed, which came into full operation during the year 1891-92, will be found in pages 5—8 of the Administration Report of the year 1889-90, or in pages 6, 7 of the Administration Report of the year 1890-91.

33. The following is a classified statement of the total number of rain-gauge stations at the end of the year in the various political divisions of the empire, and

of the number of rain-gauge stations of which inspection reports were received by the Indian Meteorological Office during the year 1907-08 :—

Province or Division.	Number of rain-gauges supplying returns for publication on 31st March 1908.	Number of inspections of rain-gauges in 1906-07 of which copies of the reports were received in the Simla Meteorological Office.				Percentage of inspections of which copies of reports were received to total number of rain-gauges.
		Good.	Fair.	Bad.	Total.	
Eastern Bengal and Assam ...	232	42	8	...	50	23
Baluchistan	61	...	...	...	...	...
Bengal	312	58	18	1	77	31
Bombay and Sind	289	...	...	...	...	...
Burma	185	25	4	2	31	17
Central India	115	...	...	...	...	...
Central Provinces and Berar ...	170	48	10	...	58	31
Hyderabad	92	...	...	...	...	...
Kashmir	37	...	...	...	...	...
Madras (including Pudukkottai, Coorg, Travancore and Cochin).	497	232	148	8	388	74
Mysore	77	...	...	...	...	...
North-West Frontier Province ...	34	1	...	...	1	...
Punjab	189	58	16	4	78	27
Rajputana	179	24	2	1	27	12
United Provinces of Agra and Oudh ...	278	17	3	...	20	10
Total ...	2,677	505	209	16	730	...

Note.—In several cases the same gauge was inspected more than once during the year.

34. The registration of rainfall in India has invariably been carried out by the provincial authorities and in the larger provinces under the general control of the Boards of Revenue. Previous to 1889 the hours and arrangements for the registration of rainfall differed largely in different provinces. In 1889 a uniform system was introduced by the Government of India, and the Director General of Observatories was made consulting officer in connection with this work. The local officers superintend the registration of rainfall and submit brief annual administrative reports to their respective Governments, copies of which should be forwarded to the head of this department.

The following paragraphs give a brief summary of the reports of rainfall registration for the year 1906-07 submitted to the various Local Governments and Administrations by these local officers.

35. *Baluchistan.*—No report was received.

36. *Bengal.*—During the year new rain-gauge stations were started at Pachet, Amlagara, Poorya, Sonakhalla, Jenkia and Tanghi, and six stations were closed. The total number of rain-gauges in use on the 31st March 1908 was 312. Sixty-four were inspected in the course of the year.

37. *Bombay and Sind.*—"The total number of rain-gauge stations in the Presidency including Sind which reported rainfall to this office was 336 as against 337 in the previous year—one station (Talegaon Dabhoda in the Poona District) having been discontinued."

"Out of a total of 275 gauges in the British Districts, 195 or about 71 per cent. as against 216 or about 78 per cent., last year, came under inspection.

64 of these were inspected more than once and the total number of inspections amounted to 280 as against 347 in the previous year. Sufficient attention did not appear to have been paid to this piece of work in 4 districts in the Deccan, 2 districts in Gujarat, and one district each in Karnatak, Konkan and Sind. The attention of the Collectors concerned is being invited to it."

"Inspection in the Native States showed a little improvement over last year, 37 out of a total of 61 rain-gauges, or merely 61 per cent. as against 59 per cent., last year, having come under inspection this year; 5 gauges were inspected more than once, the total number of inspections amounting to 43, same as last year."

38. *Burma.*—"The total number of rain-recording stations in the Province is 185 against 183 at the close of the preceding year, of which 14 are Meteorological Observatories and 22 are under the charge of the Public Works Department.

"Three new stations were opened during the year, namely:—Cheduba in the Kyaukpyu District, Pyu in the Toungoo District, and Ngazun in the Sagaing District. All these are under the charge of the Civil Department. The Nattalin station in the Tharrawaddy District was closed in April 1907, as there was no one in the station capable of making accurate records of the rainfall.

"The total number of rain-gauges inspected during the year was 147, of which 133 are reported in good condition, 9 in a fair state and 5 bad. The rainfall is reported to be properly registered in all the stations inspected except in Hmawbi (Hanthawaddy District) where it was found that the rain-gauge was buried beneath a wagon load of stones. It has therefore been decided to discontinue the registrations of rainfall temporarily, but the Agricultural Department has consented to arrange for accurate observations when a resident staff is appointed for the Hmawbi Agricultural farm. The position of 106 stations is reported as good, 28 as fair and 13 as bad. The main defects are faulty position owing to the close proximity to the gauges of buildings or trees or unevenness of the mouth of the funnel and where possible steps have been taken to remedy these. The Deputy Commissioner, Tavoy, has arranged to remove the tree adjoining the gauge in the Yebyu in his District and the Deputy Commissioner, Prome, contemplates shifting the gauge at Prome to a new site.

"During the year one complete rain-gauge was supplied to the Deputy Commissioner, Kyaukpyu, for use in the newly-opened rainfall registration station, Cheduba. In addition to this seven measuring glasses, three receivers, three funnels, three spirit levels and 2 cylinders were supplied to other stations in the Province to replace old and unserviceable ones.

"The returns sent to this office were on the whole received punctually except in the case of some stations where delays are unavoidable owing chiefly to difficulties of communication."

39. *Central India.*—No report has been received.

40. *Central Provinces and Berar.*—"The number of rain-gauges maintained in the Central Provinces * was 105 as in the previous year. Of this number 9 are observatories under the control of the Meteorological Department and of the 96 remaining 23 are managed by the Medical Department, 15 are maintained by Feudatory States and 58 are either in charge of kanungos, police muharrirs or schoolmasters. The total number of inspections made of the rain-recording stations in the Central Provinces aggregated 130 against 132 in the preceding year and 121 in the year 1905-06.

"The number of rain-gauges in Berar during the year remained unaltered, namely 44. Of this number 4 are observatories under the control of the Meteorological Department and of the remainder 37 are managed by civil surgeons and hospital assistants and 3 by tahsildars. No rain-gauge station was established or abolished during the year, and the situation of the rain-gauges remained the same.

The number of inspections made of the rain-gauge stations during the year was 115 against 124 in the previous year."

* Other than those under the Irrigation Department.

41. *Eastern Bengal and Assam.*—The total number of stations on the 31st March 1908 was 232, 110 in the Eastern Bengal and 122 in the Assam districts, as compared with 107 and 122, respectively in the previous year. Three new stations were opened during the year under report in the Dacca district. 121 different rain-gauges were inspected during the year.

42. *Hyderabad.*—No report was received.

43. *Kashmir.*—No report was received.

44. *Madras.*—"On the 31st March 1907 there were 465 rain-recording stations, excluding the meteorological observatories, furnishing rainfall returns for publication in the Fort St. George Gazette. To these six more were added and one was closed during the year, so that on 31st March 1908 there were 470 Revenue Board rain stations and 26 meteorological observatories furnishing rainfall returns. Of this total 391 are in the Madras Presidency and 344 or 88 per cent., were inspected during the year. In January 1908 a list of rain-gauge stations not inspected or reported on since 1st April 1907 was sent to the Collectors and the Assistant Commissioners of Salt, Abkari and Customs Department, with a request that, if possible, these stations should be inspected before the end of the official year. All the stations in the Godavari, Nellore, Chingleput, South Canara, South Arcot, Salem, Cuddapah and Kurnool districts were inspected, and the inspection list in the other districts was almost equally satisfactory except in Ganjam, North Arcot, Malabar and Anantapur, where only about half the number of the stations were visited. Thirty-seven indents for rain-gauges, glass measures, etc., were received and submitted to the Imperial Meteorological Office for compliance: while village rain-gauge funnels and measuring cans were made under the supervision of this Office at Madras and supplied to the Collectors of Kistna, Salem and Tinnevelly."

45. *Mysore.*—The number of Rain-gauge stations in the state subject to inspection was 212 at the close of December 1907, as against 209 of the previous year, there being an increase of three. The total number of gauges inspected during the calendar year 1907 was 161 or 75·9 per cent. of the total number; there was thus a falling off of about 9 per cent. from the inspection record for 1906.

46. *North-West Frontier Province.*—No report has been received.

47. *Punjab.*—"There are 40 rain-gauges under the Canal Department, and 149 looked after by district officers. The latter have increased by one, a new gauge having been established at Bari in the Rohtak District. The canal stations have tube gauges and also in some cases self-registering Watson's gauges: the latter seem to give some trouble. The civil gauges are all of Symon's pattern.

The gauges are generally in good order and suitably placed. No post cards recording inspection have been received from thirteen district officers and the attention of the Deputy Commissioner is being invited to the necessity of inspections. The Revenue Assistant of each district should inspect the gauges but they saw only 13 gauges in the whole year. My assistant and I inspect the gauge at all tahsils which we visit."

48. *Rajputana.*—No report was received.

49. *United Provinces of Agra and Oudh.*—"There are now 289 rain-reporting stations in these provinces, including the meteorological observatories, all of which use gauges of the Symons pattern.

"Out of the 276 stations under district and canal officers' supervision, 116 or nearly 42 per cent., were reported as inspected during the year under review. This is a falling off of 43 inspections or 16 per cent. since last year. In 11 districts all the gauges were inspected, in 16 districts one station only in each was inspected and in 13 districts no inspections were made.

"I regret to have to call attention to the serious falling off in the number of inspections, and would call special attention to the lack of inspection in the Lucknow district in which no station has been reported as inspected during the past three years."

50. *Summary.*—The work of rainfall registration is still being carried on in a satisfactory manner; there has been however during the last year a slight falling off in the number of gauges inspected in some districts but other districts show a gratifying improvement in this respect.

STORM WARNINGS.

51. The work of warning Indian ports of the approach of cyclonic storms or of bad weather is performed by two officers. Ports on the Bay of Bengal are warned from the Calcutta office by the Meteorologist, Calcutta, and ports on the Arabian Sea from the Simla Office by the Director General of Observatories or by one of his assistants.

The complete system at present in operation includes:—

1st.—An extended system of storm signals for use at the larger and more important ports.

2nd.—A brief system of storm signals for use at the smaller ports, chiefly for the information of native vessels and local traffic.

52. *Bay of Bengal Storm Signal Service.*—The following is a list of the ports for the warning of which during the year 1907-08 the Meteorologist, Calcutta, was responsible:—

Port Blair.	Akyab.	Chandbali.	Cocanada.
Mergui.	Chittagong.	False Point.	Masulipatam.
Tavoy.	Narayanganj.	Puri.	Madras.
Moulmein.	Barisal.	Gopalpur.	Cuddalore.
Rangoon.	Calcutta and River Hooghly.	Calingapatam.	Negapatam.
Bassein.	Balasore.	Vizagapatam.	Pamban.

Tuticorin. | Colombo.

Telegraphic information is also sent to Chittagong, Narayanganj and the Orissa ports whenever storm signals are hoisted at Saugor Island.

It may be noted that in the case of the Bengal ports and Port Blair the signals are hoisted by the direct orders of the Meteorologist, Calcutta. In the case of the Burma and Coromandel coast ports, the storm signals are hoisted by the orders of the Port Officers, acting on information respecting the path and intensity of the storms received at short intervals during their progress from the Meteorologist, Calcutta.

Storm signals were hoisted on nine occasions and various ports were warned by cautionary signals on eight occasions during the storm season. The weather was disturbed by depressions on fourteen occasions but only once did the depression develop into a severe storm, while none developed into a cyclone.

53. There are also special arrangements at Calcutta for supplying daily to Saugor Island and to certain ports in the Bay information as to the state of the weather in the Bay at 8 A. M. for the benefit of shipping. This information is given partly by a system of flag signal messages indicating generally the state of the weather in four sections of the Bay and partly by means of a special code telegram in which the information is of a more detailed character.

The daily flag signal message, according to the recent arrangements sanctioned by the Government of India, was sent to Saugor Island throughout the year and to Elephant Point from 1st April 1907 to 14th January 1908 only. This message was also sent to the Port Officer, Rangoon, during the period 15th January to 31st March.

The following officers were supplied with the flag signals and the daily weather telegram from 1st April 1907 to 14th January 1908:—

Port Officer, Rangoon.	Port Officer, Cuddalore.
Secretary, Port Commissioners, Rangoon.	Ditto, Negapatam.
Port Officer, Cocanada.	Port Conservator, Porto Novo.

Deputy Port Conservator, Madras.

The following officers received the daily weather telegram only during the period from 1st April 1907 to 14th January 1908:—

Port Officer, Moulmein.
Ditto, Akyab.
Ditto, Gopalpur.
Ditto, Vizagapatam.

The Port Officer, Chittagong, received the daily weather telegram and the flag signal message from 16th May to 15th November.

The telegram was also sent to the Port Conservator, Calingapatam, on Sundays, Wednesdays, and Thursdays.

The following officers were added to the list of officers receiving warning telegrams during bad weather or cyclonic storms on the Madras coast :—

Executive Engineer,	Godavari Eastern Division, Dewlaishweram.
Ditto,	Godavari Western Division at Chettipet *via* Nidadavol.
Ditto,	Godavery Conservancy Division, Rajahmundry.
Ditto,	Kistna Eastern Division, Bezwada.
Ditto,	Nellore Division, Nellore.
Ditto,	Cauvery Division, Tanjore.
Collector of	Godavari, Cocanada.
Ditto,	Kistna, Masulipatam.
Ditto,	Guntur, Guntur.
Ditto,	Nellore, Nellore.
Ditto,	Tanjore, Tanjore.
Ditto,	Trichinopoly, Trichinopoly.

54. *Arabian Sea Storm Signal Service.*—The work of warning the Arabian Sea ports was carried out during the past year by the Simla Meteorological Office which also warned the Madras ports on the Malabar coast in the same manner as the Meteorologist, Calcutta, warned the Madras ports on the coast of the Bay of Bengal. Warnings of storms in the Arabian Sea were also sent to the Port Officer, Aden, for the information of steamers leaving that port for Colombo, Bombay and Kurrachee. Copies of all warnings sent to the Malabar ports were forwarded for information to the Master Attendant, Colombo; the Commercial Agent to the Diwan of Alleppi; the Presidency Port Officer, Madras; the Deputy Port Conservator, Madras; and the Chief Engineer for Irrigation, Madras.

Warnings were also sent to the Dewan of Junagadh, the Sub-divisional Officer, Sacrifice Rock Lighthouse, Badagara, and, indirectly through the Commander of the Port, Mormugao, to the Portuguese port of Din.

The following is a list of the Bombay and Malabar ports for the warning of which during the year 1907-08 the Simla Meteorological Office was responsible :—

I.—By extended system.	II.—By Brief system.	
Kurrachee.	Cutch-Mandvi.	Murud-Janjira.
Bombay.	Jamnagar.	Ratnagiri.
Mormugao.	Dwarka.	Harnai.
Mangalore.	Porbandar.	Malwan.
Tellicherry.	Veraval.	Goa.
Calicut.	Jafrabad.	Vengurla.
Cochin.	Bhavnagar.	Karwar.
	Daman.	Kumta.
	Alibag.	Honavar.

55. In 1907-08 there were four periods of bad weather in the Arabian Sea for which warnings were issued, the most important disturbance being a storm of

considerable intensity which formed off the Kathiawar coast on the 3rd June 1907. Signals were hoisted at all ports from Kurrachee to Bombay, Danger Signal No. 3 (intimating that the storm would cross the coast at or near to the port) being displayed at Kurrachee from the early morning of the 5th. The storm centre actually crossed the coast at Kurrachee at 12-30 on the 6th and did considerable damage; but the greater part of the shipping was saved owing to precautions taken on receipt of the warnings. A prolonged period of unsettled weather lasting from the 11th to the 18th June followed the disappearance of this storm, and was itself succeeded by another storm which appeared off the Sind coast on the 20th and crossed that coast next day to the east of Kurrachee. Warnings were sent to all ports from Kurrachee to Colombo during the period of disturbed weather but for the storm that followed warnings were not necessary for any ports south of Bombay.

On the 5th November 1907 an area of disturbed weather from the Bay of Bengal passed westwards over Ceylon into the south of the Arabian Sea, and apparently developed into a cyclonic storm, which probably moved northwestwards, ceasing to effect the Indian Seas by the 10th. Warnings were issued to all ports from Colombo to Kurrachee.

In addition to the above disturbances in the Arabian Sea a depression of the winter type passing through Baluchistan from Persia in February 1908 occasioned strong winds on the Mekran coast, and Kurrachee was informed on the 17th of the conditions prevailing there.

Seasonal Forecasts.

56. The forecast for the monsoon period of 1907, dated the 8th June, was sent to Local Governments and Administrations, communicated to the Press and printed in the Gazette. A statement of the rainfall of June and July with a forecast for August and September was drawn up on the 8th August and published in a similar manner.

A statement of the actual rainfall during the monsoon period and a comparison of the two forecasts with actual rainfall was drawn up on the 10th December 1907 and sent to Local Governments and Administrations.

As the result of the comparison of the monsoon forecasts it appeared that the effect of the heavy snowfall in producing delay in the establishment of the monsoon and diminished total rainfall in north-west India was rightly interpreted in June, as also was the disappearance of this influence in August; and the unsteadiness of the general conditions was recognized. But of the most important feature of the monsoon, its failure in September, there was no intimation; and the anticipation in the June forecast that the total rainfall of India during the period June to September was likely to be up to the normal, was not verified.

57. A memorandum on the weather during October and November, 1907, with a forecast of the rainfall in northern India and of the snowfall on the neighbouring mountain areas during the cold weather of 1907-08, was prepared on the 6th December and issued in the same manner as the forecast of the previous June. The inferences given in the memorandum were:

"It appears from the records of the past thirty years that conditions like those of the present season have been followed by a deficiency of precipitation in January definitely, but not very conspicuously, more often than by an excess. The rainfall and snowfall during the earlier portion of the approaching cold weather are therefore somewhat more likely to be below than above the average, but it does not appear that a definite forecast of a deficiency would be justified.

The evidence now available does not afford any indications with regard to the precipitation of February."

On the 8th July 1908 a comparison of the actual rainfall with the above forecast was issued, it stated:

"The actual data show that during December there was a strong defect, and in January an excess. The total rainfall during these two months, the

earlier portion of the cold weather season, proved to be in defect by about 16 per cent., while in February, for which month no forecast was made, rainfall was also in marked defect. For the cold weather period, December to February, the total precipitation proved to be decidedly below normal."

FLOOD WARNINGS AND WEATHER FORECASTS TO DISTRICT OFFICERS, IRRIGATION AND OTHER OFFICERS OF THE PUBLIC WORKS DEPARTMENT AND TO EXPEDITIONS IN THE FIELD.

58. This work is carried out chiefly by the Simla Meteorological Office but partly by that of Calcutta. The arrangements for it have been sanctioned at various times, and differ considerably in character, depending upon the nature and extent of the flood or weather warnings required by the officers concerned. In some cases these officers require telegrams warning them of advancing storms likely to give heavy rain; in other cases they require telegrams giving information of actual heavy rainfall in the hill districts, likely to give rise to severe floods which might injure the railways or canal works in the submontane districts under their charge; and in others they require warnings or forecasts of the weather for as long a period beforehand as possible, so as to enable them to modify their arrangements for carrying on the works under their charge so far as may be necessitated by sudden or large changes of weather.

59. Warnings of heavy rain likely to give rise to floods in the Nerbudda and Tapti rivers are sent to nine officers in the Presidency of Bombay (Bombay City, Gujarat and Khandesh). The telegrams which are sent by the Simla Office warn these officers of the existence of storms likely to give heavy rain, and the meteorological observers of Hoshangabad, Jubbulpore, Khandwa, Pachmarhi, Amraoti, Akola and Chikalda telegraph directly to the same officers the actual amount of the rainfall whenever it exceeds three inches in twenty-four hours.

60. Arrangements have been in force for some time whereby telegrams recording heavy rain in the Punjab and neighbouring districts are sent to certain selected officers of the North-Western Railway to warn them of the probability of floods on different parts of the line. In order to save the time occupied by the transmission of the weather messages to Simla and the re-transmission of their contents to the railway officials concerned, it has been arranged that whenever there is a fall of 2″ of rain in 24 hours at Simla, Chakrata, Sialkot, Murree, Peshawar, Cherat, Srinagar or Gulmarg, information of the occurrence shall be telegraphed direct by the meteorological observers at those stations to the railway officials concerned.

61. In 1906 arrangements were made whereby the Executive Engineer, northern drainage and embankment division, Calcutta, should receive notice direct from the meteorological observers in Chota Nagpur of the occurrence of rain amounting to 3″ or more in 24 hours. This warning system was extended in 1907-08 to include the sub-divisional officer in charge of the canal at Edilpore and the Executive Engineer, Jajpur Division, Cuttack and, except in the case of the last-named officer, the Simla Office now sends warnings whenever there is a probability of heavy rainfall affecting the areas concerned.

62. During the year the Engineer-in-Chief of the Nagda-Muttra railway asked for warnings against heavy rain in the catchment area of the Chambal River. It was arranged that the Simla Office should warn him whenever there was a likelihood of heavy rain, and that the meteorological observers at Indore and Neemuch should telegraph to him whenever there was an occurrence of over two inches of rainfall in twenty-four hours.

63. The number of district officers and officers in the Irrigation, Railway and Public Works Departments requiring warnings from Simla amounted at the end of the year to 86.

This number does not include captains of mail steamers and other vessels who occasionally telegraph from Kurrachee, Aden and other ports for the latest intelligence respecting the position and movement of cyclonic storms, nor does it include the names of other individuals or firms who ask for special forecasts.

The number of special warning messages sent during the year 1907-08, was 1,149, as compared with 990 in 1906-07 and 554 in the year before.

64. Warnings of floods or of heavy rainfall were issued by the meteorologist, Calcutta, to 27 officers of the Public Works, Telegraphs and other Departments, chiefly in Bengal and on the east coast.

65. Instructions were issued eight years ago by the Government of India that every officer to whom storm or flood warnings are issued, should in the month of January of each year, or in the case of military expeditions at the close of the campaign, forward to the head of this department a brief return of the warnings received during the past year and should also report:—

(1) Whether the warning telegrams were rapidly transmitted and delivered by the Telegraph Department.

(3) Whether the warnings were timely and satisfactory in every respect and, if not, in what points they were defective.

(3) Whether any changes might be made in the system which would make the warnings more useful.

Reports on the storm and flood warnings for the year 1907 were received from fifty officers. Of these thirty-three reported that the warnings were timely and satisfactory and were rapidly transmitted by the Telegraph Department.

Fifteen offered no remarks and two officers reported that they had received no warnings during the year. No suggestions were made for improving the usefulness of the Flood Warning Service.

Transmission of messages from the Andaman Islands by wireless telegraphy.

66. Arrangements were made in 1905 for the transmission by wireless telegraphy of the 8 h. observations from Port Blair and Slipper Island and of special observations in the case of unsettled conditions in the Bay of Bengal.

The service worked in a most satisfactory manner during practically the whole of the year 1907-08, with the exception of a period of 24 days in June and July, and the information that it conveyed again proved of the greatest value in connection with the daily weather reports of Simla, Calcutta and Madras, as well as in the more important work of warning for storms in the Bay.

Daily weather telegraphic summary.

67. Changes were made last year by which it became possible to despatch the daily telegraphic summary at noon and these have worked satisfactorily; it was very seldom during the year that the despatch was delayed for more than a few minutes.

The summary is now posted at certain telegraph offices, is sent to 79 servants of Government, to 7 subscribing newspapers and to 12 private subscribers.

Publications.

A.—Weather Reports.

68. *India Weather Reports.*—The following weather reports, giving information of the current weather to the Government and the public, were published during the year by the Simla Meteorological Office :—

(1) India Daily Weather Report.

(2) India Weekly Weather Report, giving an account of the weather and of the rainfall of the week ending on the previous Thursday, published in the *Gazette of India* every Saturday.

(3) Monthly supplement to the India Daily Weather Report.

(4) Annual supplement to the Daily Weather Report.

(5) India Monthly Weather Review, giving a general summary of all the important features of the weather and complete meteorological data of the month.

(6) Annual Summary of the Monthly Weather Reviews.

It was stated in last year's administration report that an attempt was being made to arrange the divisions for which meteorological data are calculated and published in the several publications of the Simla Office in some simple way in order to facilitate their application to Administrative, Commercial and Agricultural ends.

A decision as to the most suitable method was arrived at after consultation with other departments interested in climatic data and the sanction of the Government of India was given to the proposed changes.

The system of treating data which is now in operation in the department is to arrange those received from meteorological stations according to the following main and sub-divisions :—

Main Divisions.	Sub-Divisions.
	Bay Islands.
Burma	Lower Burma.
	Upper Burma.
Eastern Bengal and Assam	Assam.
	Eastern Bengal.
Bengal...	Bengal.
	Orissa.
	Chota Nagpur.
	Bihar.
United Provinces	United Provinces, East.
	Do. do. West.
Punjab	Punjab, East and North.
	Punjab, South-West.
North-West Frontier Province ...	North-West Frontier Province.
Sind	Sind.
Rajputana	Rajputana, West.
	Rajputana, East.
Bombay	Gujarat.
	Konkan.
	Bombay Deccan.
Central India	Central India, West.
	Do. do., East.
	Berar.
Central Provinces	Central Provinces, West.
	Central Provinces, East.

Main Divisions.	Sub-Divisions.
Hyderabad	Hyderabad, North.
	Do. South.
Mysore	Mysore.
Madras	Malabar.
	Madras, Southeast.
	Do. Deccan.
	Do. Coast, North.

The three areas, Bay Islands, Kashmir and Baluchistan, not included in any main division, are classed with the above sub-divisions.

These divisions having been accepted as meteorological units are used in all departmental reports and tables of meteorological statistics. The new arrangement greatly reduced the work of tabulation in the department, for while previously nearly every report issued by the department differed as to the areas to which the data referred, and so necessitated the preparation of separate tables in each case, it became possible to arrange the data according to the new divisions once for all and use the results so obtained in each of the separate discussions.

69. *India Daily Weather Report.*—The number of stations for which data were given in the daily report of the 31st of March 1907 was 173, and in that of the 31st March 1908, 175. The report was issued on March 31st, 1908, to 529 recipients or 18 more than on the same date of the previous year.

On the 1st October 1907, the new divisions as described in para. 69 were brought into use, and the map on page 4 of the report was changed to show the new divisional boundaries.

70. *India Weekly Weather Report.*—The Weekly Weather Report was published in the *Gazette of India* as in previous years. During the cold weather this report and tabular statement were, as usual at that time of year, telegraphed from Simla to Calcutta in time for publication in the *Gazette.*

On the 3rd of October the divisions used in this Report were changed to those mentioned in paragraph 69 above.

Up to the report of the 10th October it had been usual to give in these reports the rainfall in hundredths of an inch, but in that and subsequent issues the rainfall amounts were given to the nearest tenth.

71. *Monthly Supplement to the India Daily Weather Report.*—This supplement was introduced in July 1906 in order to afford as soon as possible after the end of each month a short account of the weather of the month and a tabular statement of temperature, cloud, humidity and rainfall.

For this purpose it is not necessary to have the complete reports from all stations under the department for conclusions, correct in general, can be drawn from the data used in the Daily Weather Reports. As the fuller data do not have to be awaited, it is possible to issue this short general monthly report within a few days of the end of the month; and about twelve weeks before the larger complete Monthly Weather Review can be produced.

72. *Annual Supplement to the India Daily Weather Report.*—This supplement was published for the first time in January 1908 and gave a short summary of the chief meteorological features of the year 1907.

73. *India Monthly Weather Review.*—Considerable changes were made in the Monthly Weather Review. The data were classified on the new basis already

described and the divisions in the Monthly Weather Review were thus brought into line with those used in the Daily Weather Report. The matter of the Review is now presented in the following order :—

Introduction.

Summary of the chief features of the weather in India during the month.

Solar, seismic and magnetic disturbances.

Weather in the Indian monsoon region.

Depressions and cyclonic storms.

Pressure.

Temperature.

Winds.

Humidity and cloud.

Rainfall.

Snowfall.

Crop report.

Table A.—Abstract of observations taken at 10 hrs. and 16 hrs. at 38 stations in India, etc.

Table B.—Abstract of observations taken at 8 hrs. at 235 stations in India, etc.

(1) Provincial means.

(2) Data of stations.

Table C.—Abstract of observations taken at 8 hrs., at 25 fourth class stations in India, etc.

Plate I.—India Weather Chart shewing the monthly mean of 8 hrs. distribution of pressure, wind direction and wind velocity.

Plate II.—India Weather Chart shewing the departure from normal of the monthly mean of 8 hrs. pressure.

Plate III.—Two charts shewing the departure from normal of the monthly mean of daily (*a*) maximum (*b*) minimum temperature respectively.

Plate IV.—Two charts (*a*) shewing the departure from normal of the monthly mean of daily mean temperature ; (*b*) shewing the monthly mean of pressure and resultant wind direction.

Plate V.—Two charts (*a*) shewing the departure from normal of the monthly mean of absolute humidity at 8 hrs. ; (*b*) shewing the departure from normal of the monthly mean of relative humidity at 8 hrs.

Plate VI.—Two charts (*a*) shewing the departure from normal of the monthly mean of cloud amounts at 8 hrs. ; (*b*) shewing the total number of days in the month on which rainfall equalled or exceeded 0·10 inch.

Plate VII.—India Weather Chart shewing normal monthly rainfall and the departure from normal of the actual monthly rainfall.

It will be seen from the above in comparison with an old Monthly Weather Review that Tables I and II of the latter became respectively Tables B and A of the former and that a new table, Table C, was added to contain the data of all observatories that did not record barometric pressure. The changes in the plates were the re-arrangement of the divisions according to the new scheme and the omission of the chart shewing the monthly distribution of rainfall. This chart was based on the rainfall returns of the meteorological observatories alone, while the second rainfall chart, Plate VIII of the previous reviews which has now become Plate VII, is based on the fuller data from the many rainfall stations under the

various Local Governments, and so gives much more reliable information. There appeared to be no reason for continuing to publish two rainfall charts, and for the above reasons the latter was preferred. Owing to the postponement of the publication of the Monthly Weather Review from January 1907, until a decision had been reached with regard to the proposed changes, and as the changes when decided on necessitated the preparation of new engraved plates the reviews were very late in appearing, and at the end of March 1908 they had only been published up to March 1907.

74. *Annual Summaries.*—The annual summary of the meteorology of India for 1906 supplementing the Monthly Weather Reviews for that year, was issued in April 1908. It contains mean data for the year and a discussion of its more important meteorological features together with their relations to each other. A summary of the meteorology of the year 1906 was prepared for the Sanitary Commissioner with the Government of India, and was given as Chapter I of the Annual Report of that officer for the year 1906.

75. *Special Charts.*—The Simla office prepared, throughout the year, weekly charts showing the character of the rainfall of each week and of the seasonal rainfall up to date, for the use of His Excellency the Viceroy, His Majesty's Under-Secretary of State for India, London, and the Secretary to the Government of India in the Revenue and Agricultural Department. Similar charts were also forwarded to the Lieutenant-General Commanding the Forces in Bengal, Naini Tal.

The Calcutta office of the India Meteorological Department prepared four series of seasonal rainfall charts and annual rainfall charts of the whole of India, as in previous years, for the information of the Government of India and the Secretary of State.

76. *Provincial Weather Reports.*—The following provincial reports were issued by the local meteorologists during the year :—

(1) By the Meteorologist, Calcutta—

(*a*) Bay of Bengal and Bengal Daily Weather Report. The name of this report was changed on the 1st January 1908 to "Calcutta Daily Weather Report."

(*b*) Meteorological Table for Bengal and Assam, with a summary of the chief features of the weather for the month published regularly in the *Calcutta Gazette.*

(*c*) The supplementary weekly meteorological and rainfall table containing temperature and rainfall observations recorded at 19 stations in Bengal and in Eastern Bengal and Assam was issued to all subscribers of the Calcutta Weather Report on every Wednesday throughout the year. For purposes of comparison, temperature and rainfall observations recorded during the corresponding week of 1907 were added to the report.

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(2) By the Meteorologist, Bombay—

(*a*) Bombay Daily Weather Report.

During the year under review the Director General of Observatories, the Director of Agriculture, the Meteorologist, Bombay, and the Secretary of the Bombay Chamber of Commerce held a conference to consider possible improvements in the Bombay Daily Weather Report to make it of more general use to those interested in climatic conditions. As a result of the conference the following changes were introduced into the report :—

(i) The size of the printed report was reduced.

(ii) The printed matter was re-arranged on the four sides of the report as follows :—

Page (*1*).—Contains a summary put into the form of a paragraphs to describe the weather features of each division.

Page (2).—Contains a map which occupies the whole page.

Page (3).—Contains the 8 h. observations.

Page (4).—Contains the bi-weekly rainfall reports and the telegraphic weather and crop reports.

(iii) Daily telegrams from six new stations were included; these were Multan, Rawalpindi, Ambala, Mainpuri, Chandra and Nizamabad (Indur).

(iv) A new map was prepared in order to include the new stations.

(v) Arrangements were made by which twelve extra stations were to send bi-weekly telegram of rainfall only.

These changes were carried out on the following dates:—

(v) Partly on 27th August 1907.

(ii) and (iii) on 2nd September 1907.

(i) and (iv) on 1st January 1908.

(*b*) Monthly, abstracts of meteorological observations published in the Bombay Government *Gazette*.

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(3) By the Meteorologist, Madras—

(*a*) Madras Daily Weather Report.

(*b*) Monthly rainfall tables for Madras, Coorg, Pudukkottai, Cochin and Travancore published in the Provincial *Gazette*.

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(4) By the Meteorologist, Allahabad—

(*a*) Monthly weather Summary of the province published in the Provincial *Gazette*.

(*b*) Brief sketch of the meteorology of the province for the year 1906.

(*c*) Monthly Rainfall Tables for the United Provinces of Agra and Oudh, published in the Provincial *Gazette*.

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(5) By the Simla Office—

(*a*) Monthly summary of the weather of the Punjab, published in the Provincial *Gazette*.

(*b*) Annual meteorological summary of the Punjab for the year 1906-07.

B.—Memoirs of the Indian Meteorological Department.

77. The following was published during the year 1906-07:—

(1) A discussion of the anemographic observations recorded at Allahabad from September 1890 to August 1904, and a discussion of the anemographic observations recorded at Lucknow from July 1878 to October 1892, by Sir John Eliot, M.A., F.R.S., K.C.I.E., late Meteorological Reporter to the Government of India and Director-General of Indian Observatories. (Memoirs of the Indian Meteorological Department, Vol. XVIII, Part III.)

78. The following were under preparation during the year:—

(1) Kite flights made at Belgaun during premonsoon and monsoon periods in 1906, by J. H. Field, M.A., Imperial Meteorologist.

(2) A discussion of some of the anemographic observations recorded at Madras. By R. Ll. Jones, M.A., Meteorologist, Madras.

(3) Types of Weather in Madras. By R. Ll. Jones, M.A., Meteorologist, Madras.

(4) Kite flights in India and over the neighbouring sea areas during 1907. By J. H. Field, M.A., Imperial Meteorologist.

(5) Correlation in seasonal variation of climate. By G. T. Walker, M.A., Sc.D., F.R.S., Director-General of Observatories.

The lithographic reproduction of the more important seismograms given by the Simla seismograph since 1905 for publication as a Memoir was also undertaken during the year.

C.—Other Publications.

79. The following was published during the year 1907-08:—

Appendix to the Handbook of Observatories. A collection of facts for departmental reference.

80. The following were under preparation during the year 1907-08:—

(*a*) A Meteorological Atlas of the Indian Seas and the North Indian Ocean, prepared chiefly by Mr. W. L. Dallas and to be published by Messrs. Bartholomew.

(*b*) Telegraphic Code and instructions for the use of the Indian Meteorological Department during stormy and suspicious weather (2nd edition).

(*c*) Tables for the reduction of meteorological observations.

Supply of Meteorological Information.

81. In addition to the meteorological information published by the department, special information was supplied to other meteorological institutions either by letter or telegram according to arrangements made.

(*a*) Weekly telegrams containing weekly pressure departures from normal of Bombay, Seychelles, Zanzibar and Aden were sent to the Director-General, Survey Department, Cairo, during the monsoon period.

(*b*) Monthly telegrams were sent to the Meteorological Office, London, during the monsoon period to inform him of the state of the monsoon.

(*c*) Monthly telegrams were sent to Sir Norman Lockyer, London, throughout the year giving 8 A.M. mean monthly pressure of Bombay reduced to S. L. and 45° latitude.

(*d*) Monthly telegrams were sent to the Meteorological Department, Sydney, Australia, throughout the year giving monthly mean pressure and temperature departures from normal of India, represented by the stations Lahore, Allahabad, Calcutta, Nagpur, Bombay, Madras and Bangalore, and a short description of the general condition of weather over India.

(*e*) Weekly code telegrams were sent during the monsoon period to the Calcutta Meteorological Office for drawing up a table of rainfall, humidity and temperature at 100 representative stations in India to be published by the Director-General of Commercial Intelligence in the Indian Trade Journal.

Miscellaneous.

82. Two mechanics are now employed regularly in the workshop in the Simla Office, and they have been engaged mainly on developing and making instruments connected with the kite and balloon work and other branches of the researches undertaken by the officers of the Department.

83. Eleven hundred and forty-seven books and pamphlets, either purchased or presented by scientific bodies, were added to the Library during the year. The Library is on the whole in fair order.

84. Nine libraries, observatories or societies were added during the year to the list of institutions to which the publications of the India Meteorological Department are supplied, and three were removed; the number on the list is now 371.

Chief features of the year.

85. The area from which meteorological information is derived was widened during the year by the establishment of new observatories at Birjand, Kerman and Kermanshah (Persia); Kaigil (Kashmir); and Monghyr; and was further extended under an arrangement by which the Foreign Department of the Government of India kindly undertook to supply weather data for past years, and in future, from the diaries of Consulates in Persia and elsewhere.

An important change in the distribution of weather information to the public was the issue of an Annual Supplement to the Daily Weather Report. This supplement brings together in a concise form the chief points of the meteorology of the year and has the advantage that it can be published within a few weeks of the close of the calendar year.

The Meteorological Atlas of the Indian Seas and the North Indian Ocean was on the point of publication at the close of the year.

Much progress was made in the scientific work of the Department on the lines indicated in the Administration Report of the previous year, and preparations for a more extended scope of the practical side of research work were undertaken.

Concluding Remarks.

86. The Meteorological Department again received valuable assistance in its work from the Survey, Telegraph and Postal Departments during the year.

87. The Telegraph Department has continued to assist the Department by the rapid transmission of daily weather telegrams, and of storm and flood warning telegrams. There are in all 24 observatories established at Departmental Telegraph Offices, the observation being taken either by the Telegraph Master or by a signaller, and except at some stations the observations were satisfactory throughout the year.

88. By permission of the Postal Department meteorological observatories are established at eighteen combined Postal and Telegraph offices. Observations at the great majority of these stations are taken by one of the telegraph signallers, but in one or two cases by the postmasters. With certain exceptions these observatories also worked satisfactorily during the year.

89. Daily weather telegrams from Aden were sent free of charge to Bombay by the Eastern Telegraph Company during the year and the Department is greatly indebted to the Eastern Telegraph Department for this valuable concession as well as for the rapid transmission of the messages.

90. The observatories at Baghdad, Ispahan, Teheran, Meshed, Muscat, Jask and Bushire furnished valuable observations throughout the year. Daily weather telegrams were transmitted as far as Kurrachee, free of cost to the Department, from Muscat, Bushire and Jask throughout the year and from Meshed, Ispahan, Teheran and Baghdad from the beginning of November to the end of the official year. These telegrams were forwarded from Kurrachee to Simla in the same manner as Indian weather telegrams, and were very useful in forecasting the approach of cold weather storms from Persia to northern India. The Department is greatly indebted to the Directors of the Persian Gulf Section and of the Persian Section of the Indo-European telegraph line for the continuance of this valuable concession.

91. Weekly telegrams were received from the 4th May to the 26th October from the Director of the Royal Alfred Observatory, Mauritius, as well as from the departmental observatories at Zanzibar and Seychelles. These

telegrams gave valuable information of the weather conditions in the Indian Ocean and the Department is indebted to the officers for the punctual transmission of the information. Thanks are more specially due to the Director of the Royal Alfred Observatory for his courtesy in placing the meteorological data of that observatory at the disposal of the India Meteorological Department.

92. The Department is greatly indebted for important information as to meteorological conditions prevailing antecedent to and during the south-west monsoon, to the Director of the Government Observatory, Durban; Mr. J. McClounie, head of the Scientific Department, Zomba, British Central Africa; the Meteorologist, Dar-es-Sallam; His Majesty's Commissioner, Entebbe, Uganda; the Director-General, Survey Department, Cairo; the Director of the Government Observatory, Perth; the Government Astronomer, Adelaide; the Government Astronomer, Sydney; the Director of the Central Nicolas Physical Observatory, St. Petersburg (for information as to Siberian conditions); the Directors of the Observatories at Buenos Ayres and Santiago; and to the various officers around the Indian frontiers who have collected and supplied valuable snowfall information.

J. H. FIELD,

Offg. Director-General of Observatories.

METEOROLOGICAL OFFICE, SIMLA;
The 12th September 1908.

G. G. B. P., Simla.—No. 274 M. R. G. I.—29-9-08.—280.—R. G. G.

REPORT

ON

THE ADMINISTRATION

OF

THE METEOROLOGICAL DEPARTMENT

OF

THE GOVERNMENT OF INDIA

IN

1909-10.

CHANGES IN THE STAFF DURING THE YEAR.

The services of Mr. Michie Smith were extended for a further period of 6 months from the 13th July 1910 to 12th January 1911.

2. Mr. Patterson went on privilege leave for 2 months and 21 days combined with special leave for 3 months and 9 days from 19th March 1909. Leave was extended on medical certificate up to 27th November 1909. Mr. Bion acted as Imperial Meteorologist.

3. Dr. Simpson went on privilege leave for 3 months from 2nd December 1909 to 1st March 1910, and on leave without pay for 3 years from 2nd March 1910. Mr. Bion acted as Imperial Meteorologist during Dr. Simpson's period of privilege leave.

4. Mr. N. U. K. Leslie went on privilege leave for 1 month and 21 days combined with furlough for 22 months and 9 days from 5th February 1910. Mr. H. A. Armstrong was appointed to act as Meteorologist, Bombay.

5. Dr. E. G. Hill, Meteorologist, Allahabad, proceeded on leave from 26th May 1909 to 16th July 1909. Dr. A. P. Sircar acted during his absence.

6. Mr. C. W. Peake went on leave from 24th March 1909 to 12th December 1909. Dr. E. P. Harrison acted.

OBSERVATORIES.

7. The observatories maintained by the Government of India are classified as follows :—

First Class.—Observatories which are furnished with autographic instruments for continuously recording pressure, temperature, humidity, and wind direction and velocity in addition to instruments read by eye.

Second Class.—Obervatories at which readings are taken daily at 8 hrs., 10 hrs. and 16 hrs.: those at 8 hrs. are (with a few exceptions) transmitted by telegram to one or more of the offices at Simla, Calcutta, Bombay and Madras for inclusion in the India or provincial Daily Weather Reports.

Third Class.—Observatories—

(*a*) where readings are taken daily at 8 hrs. only ; in those stations where there are telegraph offices the observations are transmitted by telegram for inclusion in the Simla, Calcutta, Bombay or Madras Daily Weather Reports ;

(*b*) at stations where there are no telegraph offices, and observations are recorded at 10 hrs. and 16 hrs. only ; these are included in the Monthly Weather Reviews, and furnish a series of observations for the determination of monthly and daily means which should be comparable with the means already obtained for second class observatories.

Fourth Class.—Observatories at which observations of temperature, wind and rainfall only, or of temperature and rainfall only, are recorded.

8. At the commencement of the year 279 observatories contributed registers of meteorological data ; of these 50 were non-departmental and 229 were maintained by the Government of India. At the end of the year the total number of observatories was 277 of which 50 were non-departmental and 227 were maintained by the Government of India. Of the 227 departmental observatories, 7 were first class, 20 second class, 179 third class and 21 fourth class.

9. The changes in non-departmental observatories during the year were the following :—

(1) A 3rd class observatory was opened at Muzaffarabad (in Kashmir) on the 1st February 1910, under the superintendence of the Medical Officer, Muzaffarabad.

(2) The 4th class observatory at Fraserganj was closed in April 1909.

(3) A 4th class observatory was established at Muhammerah on the 1st March 1910.

(4) The 3rd class observatory at Gangtok was changed from non-departmental to departmental in May 1909.

10. The following were the changes in departmental observatories during the year :—

(1) A 3rd class observatory was opened at Jagdalpur on the 13th October 1909.

(2) The observatories closed were :—

The 2nd class observatory at Periyakulam in May 1909; the 3rd class observatories at Pachbadra and Car Nicobar in November 1909, and March 1910 respectively ; and the 4th class observatory at Table Island in December 1909.

First Class Observatories.

11. The Directors of the Observatories of Kodaikanal, Madras and Bombay publish separate annual reports which are forwarded for the information of Government. It has accordingly been ruled as unnecessary to include information relating to the working of these observatories in this Administration Report.

12. *The Alipore Observatory.*—This observatory is under the charge of the Meteorologist, Calcutta. It is furnished with a complete set of autographic instruments, including a Bergholz barograph, a Kew barograph, a Kew thermograph, a Richard thermograph, a Beckley anemograph, a Dines pressure-tube anemometer, a Beckley rain-gauge, a Michie Smith monthly rain-gauge, and a Milne horizontal pendulum seismograph.

These instruments have on the whole worked satisfactorily during the past year.

All instruments issued by the Meteorological Department are tested at this observatory and their corrections ascertained before they are sent out for use. The number of instruments tested and verified during the year was 598 as compared with 486 last year. Eighty-eight instruments were condemned as unfit for issue, or were repaired by the Mathematical Instrument Department or the departmental mechanic, and fifteen instruments were kept in store for future treatment.

The observatory gives mean Calcutta time to the port and shipping. Three time balls are dropped daily at 1 P.M. local mean time throughout the year, one on the Semaphore Tower at Fort William, the second at the Port Commissioner's office and the third at the Kidderpore Docks.

This work was carried out satisfactorily on the whole, but there were 28 failures as compared with 12, the average number of the past 21 years; in all cases except one they were due to faulty behaviour of the electric or mechanical arrangements outside the observatory.

Year.	Number of days on which one or other ball failed to drop properly.	Number of failures due to telegraphic defects.
1909-1910	28	27
1908-1909	18	18
1907-1908	10	10
1906-1907	25	24

13. *The Allahabad Observatory.*—This observatory is under the charge of the Meteorologist, Allahabad. The self-recording instruments in use at the observatory were:—(1) a Beckley anemograph; (2) a Richard barograph; (3) a Richard thermograph (giving both wet and dry bulb records); and (4) a Stokes sunshine recorder.

There were also in use at the observatory (1) three solar radiation thermometers; (2) a grass thermometer for measuring terrestrial radiation; (3) one ground thermometer placed on the surface; (4) the ordinary instruments for eye observations of atmospheric pressure, temperature, vapour pressure, humidity, cloud, wind and rainfall; (5) six barometers for purposes of comparison and for use in the inspection of observatories; (6) a Marie Davy and a Duboscq nephoscope; and (7) a full set of ordinary thermometers in a second cage for purposes of comparison.

Beckley anemograph.—The instrument worked well throughout the year, except on five occasions when short breaks occurred in the trace.

Dines Pressure Anemometer.—The two pressure tube anemometers have been temporarily removed to the Muir College for experimental purposes.

Richard Barograph.—This instrument gave excellent tracings throughout the year. All the charts have been tabulated.

Richard Thermograph.—The wet bulb tracings of the thermograph have not been very satisfactory, but the dry bulb tracings, with a few exceptions, have been good.

Sunshine Recorder.—This worked continuously well.

Nephoscope.—Regular observations of clouds have been made with the Duboscq instruments.

Readings of all the eye instruments were taken every two hours, from 6 hrs. to 22 hrs. The earth thermometer on the surface was read at 6, 14 and 22 hrs.

14. *The Lahore Observatory.*—Eye observations of the ordinary meteorological instruments were taken seven times daily at this observatory as in past years, at 6, 8, 10, 14, 16, 18 and 22 hrs. Ground surface temperature was recorded four times daily, at 6, 10, 16 and 22 hrs.

The observatory is furnished with the following automatic instruments which have worked satisfactorily during the year:—

(1) Draper barograph; (2) Richard barograph; (3) Casella self-recording rain-gauge; (4) Beckley anemograph; (5) sunshine recorder.

Besides the above instruments there are in use at the observatory one grass radiation thermometer, and one nephoscope. The three maximum solar radiation thermometers and the ordinary sun thermometer (not self-registering), which were in use until the end of November 1909, were then discarded as unsatisfactory.

Character of the Work of Observation at Second and Third Class Observatories.

15. The general character of the work of the observatories, as judged by the number of mistakes made by observers, appears to have been satisfactory. The number of stations of great reliability in which either no mistake or only one has been detected in the data for the Indian Daily Weather Report was 18 as against 9 last year, while the number of stations at which more than 50 mistakes were made decreased from 19 to 11. It should be noted however that this improvement is partly due to a change in the method of assigning mistakes, an arrangement having been made whereby errors in transmission are now excluded from those attributed to the observer.

The usual list showing the number of mistakes in observation and in the preparation of telegrams for all the observatories which send weather telegrams to the Simla office, was prepared and circulated to the observatories at the end of the year under review.

Inspection of Observatories.

16. The number of visits paid to observatories during the year was 46 as compared with 65 in the previous year and an average of 76 during the past 10 years. The absence on leave of several officers during the touring season accounts for this diminution.

The Director General inspected the observatories at Calcutta, Bombay, Madras, Kodaikanal, Rangoon, Quetta and 5 others; he also established a new observatory at Victoria Point. Mr Gaetane inspected 16, Mr. Subrahmanyam 12, Babu Joti Lal De 2, N. C. Biswas 2 and Budha Mull 2.

Six observatories were inspected twice so that the actual number visited was 40; of these 25 were reported as good, 11 as tolerable and 4 as bad.

Condition.	Number of Observatories inspected in					
	1909-10.	1908-09.	1907-08.	1906-07.	1905-06.	1904-05.
Good or satisfactory . . .	25	40	43	68	48	58
Tolerable	11	20	18	6	13	13
Bad	4	2	10	5	4	5
Total . .	40	62	71	79	65	76

17. In estimating the general character of the observatories from the above table it must be remembered that it is, as a rule, on account of something unsatisfactory that a visit of inspection is made. The general level of the stations is thus decidedly better than might otherwise appear. The most frequent cause of bad work is the changing of observers at short intervals necessitated by acting and other arrangements in the Medical, Telegraphic and Postal Departments.

Special Observations.

18. Observations other than those recorded at regular intervals are made as follows:—

(*a*) In response to requests from the Simla or Calcutta office when weather is disturbed and storm warnings may have to be issued: such observations are always sent by telegraph. Certain observers at coast observatories are in receipt of a regular monthly allowance of Rs. 5 for sending special storm warning telegrams, while other observers receive an allowance of Re. 1 for each set of special observations sent at the request of either Simla or Calcutta. The number of telegrams of the latter class forwarded during this year was 434 as compared with 797 last year.

(*b*) Certain observers have been empowered, when they consider that conditions at sea are sufficiently threatening, to send of their own initiative to Simla or Calcutta a telegram containing special observations. Two occasions of this type occurred.

(*c*) In connection with flood warning a number of observers have been instructed to send telegrams announcing the occurrence of heavy rainfall to Government officers and railway engineers who desire early information. The number of telegrams so sent was 69 as compared with 62 last year.

(*d*) After earthquakes observers are instructed to send detailed information to the Simla office: 78 reports were received during the year.

Observations with Special Meteorological Instruments.

19. The following special observations were carried out during the past year at certain selected stations:—

1st.—Wind observations recorded by Beckley anemographs at 17 stations and by Dines pressure tube anemometers at 5 stations.

2nd.—Solar and terrestrial radiation observations at 11 and 12 stations respectively.

3rd.—Underground temperature observations at 3 stations.

4th.—Sunshine observations at 10 stations.

5th.—Barometric observations recorded by self-registering instruments, chiefly Richard barographs, at 39 stations.

6th.—Temperature observations recorded by self-registering instruments, chiefly Richard thermographs, at 19 stations.

Observations of Solar Energy in Absolute Units.

20. Observations were continued at Simla and Kodaikanal throughout the year when weather conditions allowed, by means of Angstrom's Electric Pyrheliometer.

Observations in the Upper Air.

21. In continuation of the experimental work with recording balloons, the objects of which were given in last year's administration report, 17 balloons with instruments were liberated at Jhang during the monsoon months, June and July, and 7 in December 1909; of the first set more than half were recovered, but only one of those in December. The heights reached during the monsoon ranged up to 12 miles, with a lowest temperature of about —107° F. and the descents

occurred at short distances from Jhang, in several cases within 10 miles of the starting point. The balloons in December all travelled eastward and their horizontal velocities indicated very high winds a few miles above the ground surface. The one instrument recovered had only reached the 6 mile level, with a lowest temperatureof—35° F., but it came down as far away as Lahore. It appears probable that the remaining instruments, which would in the ordinary course have reached much greater altitudes, were carried into the Himalayas or Tibet, and that, but for some defect in the balloon which touched ground in Lahore, no one of the seven instruments would have been heard of again.

A feature of the ascents in the monsoon was the liberation on two occasions of a pair of instruments together on the same balloon with a view of comparing the records of a pair and ascertaining to how great an extent the traces could be relied up to represent actual conditions. This question had assumed some importance in consequence of doubts which had been expressed by scientists at home as to the capabilities of instruments constructed so lightly as these must necessarily be. One pair was recovered and the two independent records were found to agree as well as could reasonably be expected.

Attention was paid throughout the year to the training of a native clerk, who had shown aptness in this work, with a view of enabling him to calibrate the instruments and liberate the balloons with native help only, in order that continuous systematic balloon work might be carried on from Jhang.

Seismograph Observations.

22. Seismological observations were recorded by two Omori-Ewing Seismographs at Simla and one at Bombay, by Milne Seismographs at Alipore (Calcutta), Kodaikanal and Colaba (Bombay), and by means of other self-registering instruments at the last named station. All the instruments worked satisfactorily throughout the year, and copies of the records of the Milne's Seismographs were transmitted to the Seismological Committee of the British Association.

Atmospheric Electricity.

23. The Benndorf self-registering electrometer was maintained in good order and gave a nearly continuous record of the potential gradient.

Marine Meteorology.

24. No change was made during the year under review in the method of collecting marine information.

At Calcutta and Bombay a clerk at each port spends his whole time in visiting ships, making in each case a copy of the log and a comparison of the ship's barometer with a secondary standard for the purpose of applying the necessary corrections to the readings of the logs; and after the barometer comparisons have been tabulated in the Calcutta or Bombay office a statement of the error of the ship's barometer is posted to the captain in case he should desire to make use of it. The number of ships visited is materially less than that of the vessels which come into port but it is ample for our purposes.

The data thus obtained are utilised in the preparation of charts of disturbances in the Bay of Bengal and the Arabian Sea for future reference in connection with the storm warning work of the department, and for drawing up an account of the storms of the year for publication in the Annual Summary.

25. The arrangements made with the London Meteorological Office, the Royal Alfred Observatory at Mauritius, the Weather Bureau, Washington, and the Deutsche Seewarte, Hamburg, for collecting marine data from the whole of the Indian Ocean has been continued and the thanks of this department are again due to these four offices for thus supplying a large amount of useful data.

26. Observations recorded during the year at the entrance to the River Hugli were supplied to the Meteorological Department by the light-vessels "Comet" and "Luna."

Snowfall Registration in the Mountain Districts to the North and West of India.

27. The information as to the amount, distribution and time of occurrence of the snowfall in the Himalayan and Afghan mountain areas was on the whole tolerably complete and the thanks of the Department are again due to the various officers who have collected and forwarded it. It is true that in some cases the information is rather untrustworthy, but experience shows that the general impression as to the snowfall over large areas is consistent with deductions from other meteorological factors. Reliable additions to the information have been obtained by continuing, though from a lower altitude, the series of large-scale photographs of the snows as seen from Simla which were started in 1905.

Rainfall Registration.

28. The registration of rainfall in India has invariably been carried out by the provincial authorities. In 1889 a uniform system was introduced by the Government of India, and the Director General of Observatories was made consulting officer in connection with this work. His advice is sought over the starting of new rain-gauge stations, and he receives annual reports from the local officers responsible for the registration of rainfall upon the efficiency of the work. A general account of the system, which came into operation in the year 1891-92, will be found on pages 5-8 of the Administration Report of the year 1889-90, or on pages 6, 7 of the Administration Report of the year 1890-91.

29. The following is a classified statement of the total number of rain-gauge stations at the end of the year in the various political divisions, and of the number of rain-gauge stations of which inspection reports were received by the Indian Meteorological Office during the year 1909-10.

Province or Division.	Number of rain-gauges supplying returns for publication on 31st March 1910.	Number of inspections of rain-gauges in 1909-10 of which copies of the reports were received in the Simla Meteorological Office.				Percentage of inspections of which copies of reports were received to total number of rain-gauges.
		Good.	Fair.	Bad.	Total.	
Burma	192	16	10	...	26	14
Eastern Bengal and Assam	245	59	6	5	70	29
Bengal	261	42	7	...	49	19
United Provinces of Agra and Oudh	277	20	1	1	22	8
Punjab	189	62	17	3	82	43
Kashmir	36	...	...	...	...	...
North-West Frontier Province.	34	...	1	...	1	3
Baluchistan	64	...	...	...	...	...
Rajputana	180	17	2	1	20	11
Bombay and Sind	289	...	...	...	...	...
Central India	115	...	...	...	...	...
Central Provinces and Berar	171	43	7	...	50	29
Hyderabad	22	...	...	...	...	...
Mysore	77	...	...	...	...	...
Madras (including Pudukkottai, Coorg, Travancore and Cochin).	502	318	99	15	432	68
Total	2,654	577	150	25	752	28

Note.—In several cases the same gauge was inspected more than once during the year.

The following paragraphs give a brief summary of the reports of rainfall registration for the year 1909-10.

30. *Burma.*—"The total number of rain-recording stations in the Province is 192 against 190 at the close of the preceding year. Of these 14 are Meteorological Observatories and 25 are under the charge of the Public Works Department."

31. *Eastern Bengal and Assam.*—The total number of stations on the 31st March 1909 was 247, of which 118 were in Eastern Bengal and 129 in Assam, as compared with 112 and 124, respectively, in the previous year. Twelve new stations were opened during the year under report. In the district of Faridpur a large number of new stations were added, the number being at present 10 against 5 in the preceding year. Out of the total number of 245 gauges 163 were inspected during the year, and 41 of these were inspected more than once: this marks a great advance on last year, when out of 322 gauges only 85 were inspected.

32. *Bengal.*—The number of stations on the 31st March was 354 but of these a large number had not been sending returns, thus in March the rainfall of only 261 stations was printed. The number of stations inspected was 74, and this work was considerably neglected in some districts, no more than one station having been inspected in the districts of Birbhum, Midnapore, Hooghly, Patna, Shahabad, Saran, Muzaffarpur, Bhagalpur, Purnea, Darjeeling, Sonthal Parganas, Balasore, and Puri, or in the Urrya Feudatory States and the Orissa Tributary Mahals.

33. *United Provinces of Agra and Oudh.*—There are now 287 rain-reporting stations in these provinces, including the meteorological observatories, all of which use gauges of the Symons pattern.

Out of the 273 stations under district and canal officers' supervision, 157 or 58 per cent. were reported as inspected during the year.

In 13 districts all the gauges were inspected, in 10 districts one station only in each was inspected and in 2 districts no inspections were made. Serious efforts are being made to secure satisfactory exposures; 5 gauges have been moved to new sites, at 10 stations trees in the vicinity of the gauges have been cut down, and at many other stations orders for improvements have been issued.

34. *Punjab.*—The total number of rain-gauge stations in the Punjab is 203 or 13 more than last year. Of these 153 are in charge of the district officers and 50 are under the canal department.

"The rain-gauges at Bhiwani and Kabirwala were fixed at more suitable places and that at Nawanshahr, which was found defective, was replaced by a new one. Necessary replacements and repairs were also done to several other rain-gauges which stood in need of them.

"The different Revenue Officers made 108 inspections during the year as against 109 made during the previous year. Besides this the Deputy Commissioners of Delhi, Amritsar, Gujarat, Shahpur, Attock, Jhang and Muzaffargarh made several inspections of which they did not submit post card inspection reports. No post card inspection reports were received at all from the Settlement Officers, Delhi and Gurdaspur, and Deputy Commissioners, Lahore, Amritsar, Sialkot, Rawalpindi and Lyallpur. My personal Assistants and I made 39 inspections only 12 Revenue Assistants out of 29 made 25 inspections during the year.

"All the rain-gauges under the charge of canal officers have been periodically inspected and have been maintained in good order throughout the year. (The tube rain-gauge at Jaman, the rain-gauges at Lalu Gudar, and Jiwan Shah in the Upper Bari Doab canal circle, and the tube rain-gauge at Laungwali in the Upper Chenab canal circle went out of order and the necessary steps were taken to get them repaired.) Most of the Watson's self-registering gauges in the Western Jamna canal circle con tinued to give trouble. The rainfall records are reported to have been neatly and properly kept.

"The rain-gauges under the District Officers are reported to be in good order. The rainfall records are properly kept up The Deputy Commissioner of Multan reports that the question of raising the number of rain-gauges in his District is under consideration."

35. *Kashmir.*—No report has been received.

36. *North-West Frontier Province.*—No report has been received.

37. *Baluchistan.*—No report has been received.

38. *Rajputana.*—No report has been received.

39. *Bombay and Sind.*—"The total number of rain-gauge stations in the Presidency and Native States which reported rainfall to this office was 336, the same as in the preceding year."

"Out of the total of 275 gauges in the Pesidency, 186 or about 68 per cent., as against 183 or about 66 per cent. last year, were brought under inspection. 74 of these were inspected more than once and the total number of inspections amounted to 282 as against 289 in the previous year. Sufficient attention does not appear to have been paid to this work in 3 districts in the Deccan, and 2 districts each in the Karnatak, Konkan and Gujarat and 1 district in Sind. The attention of the Collectors concerned is being invited to it."

Inspection in the Native States maintained the improvement shown last year, 43 out of a total of 61 rain-gauges, or nearly 70 per cent., having come under inspection this year; 7 gauges were inspected more than once, the total number of inspections amounting to 51.

40. *Central India.*—No report has been received.

41. *Central Provinces and Berar.*—"The number of rain-gauges maintained during the year was 107 against 105 in the previous year. Of this number 11 were observatories under the control of the Meteorological Department; 26 were managed by the Medical Department, 15 were maintained by Feudatory States and 55 were in charge of Kanungos, Police Muharrirs and School Masters.

"The number of inspections of rain-gauge stations in the Central Provinces during the year, of which reports were received, was 125 against 148 in the preceding year and 130 in 1907-08.

"The number of rain-gauges in Berar during the year remained the same, namely 44. Of this number 4 were observatories under the control of the Meteorological Department and of the remaining 40, which are under the control of the Director of Land Records, Central Provinces, 37 are supervised by the Civil Surgeons and Hospital Assistants and 3 by Tehsildars. The number of inspections of rain-gauge stations during the year was 154 against 129 in the previous year."

42. *Hyderabad.*—No report has been received.

43. *Mysore.*—No report has been received.

44. *Madras.*—"On the 31st March 1909 there were 476 rain recording stations excluding the meteorological observatories furnishing rainfall returns for publication in the Fort St. George Gazette. There was thus no change in the number of stations at the end of the year. Of the 392 stations in the Presidency, 355 were inspected, *i.e.*, 91 per cent." The amount of inspection in Madras continues very satisfactory.

45. *Summary.*—The work of rainfall registration continues to be carried on in a satisfactory manner; and there is evidence of increased realization of the need of regular inspection in order that reliable results may be secured.

STORM WARNINGS.

46. The work of warning Indian ports of the approach of cyclonic storms or of bad weather is performed by two offices. Ports on the Bay of Bengal are warned from the Calcutta Office by the Meteorologist, Calcutta, and ports on the Arabian Sea from the Simla Office by the Director General of Observatories,

The complete system at present in operation includes :—

1st.—An extended system of storm signals for use at the larger and more important ports.

2nd.—A brief system of storm signals for use at the smaller ports, chiefly for the information of native vessels and local traffic.

47. *Bay of Bengal Storm Signal Service.*—The following is a list of the ports for the warning of which during the year 1909-10 the Meteorologist, Calcutta, was responsible—

Port Blair.	Akyab.	Chandbali.	Cocanada.
Mergui.	Chittagong.	False Point.	Masulipatam.
Tavoy.	Narayanganj.	Puri.	Madras.
Moulmein.	Barisal.	Gopalpur.	Cuddalore.
	Noakhali.		
	Goalundo.		
	Calcutta and River Hooghly.		
	Balasore.		
Rangoon.		Calingapatam.	Negapatam.
Bassein.		Vizagapatam.	Pamban.

Tuticorin. | Colombo.

To these Diamond Island was added during the year.

Telegraphic information is also sent to Chittagong, Narayanganj, Barisal and the Orissa ports whenever storm signals are hoisted or lowered at Saugor Island; and to Bassein when signals are hoisted or lowered at Diamond Island.

It may be noted that in the case of the Bengal ports and Port Blair the signals are hoisted by the direct orders of the Meteorologist, Calcutta.

In the case of the Burma and Coromandel coast ports the responsibility of the Meteorologist, Calcutta, has been hitherto limited to giving as full and definite information as was possible respecting storms to the port authorities, leaving the question of hoisting and lowering storm signals to their discretion, but from September last the Meteorologist, Calcutta, has been instructed by the Director-General of Observatories to suggest the particular storm signal to be hoisted. This change has been made in consultation with the local Governments in order to fix more definitely the responsibility for hoisting the signals.

Storm signals were hoisted on seven occasions and in addition various ports were warned by cautionary telegrams on nine occasions during the storm season. The weather was disturbed by depressions on ten occasions, and five times the depression developed into a cyclonic storm.

48. There are also special arrangements at Calcutta for supplying daily to Saugor Island and to certain ports in the Bay information as to the state of the weather in the Bay at 8 A.M., for the benefit of shipping. This information is given partly by a system of flag signal messages indicating generally the state of the weather in four sections of the Bay, and partly by means of a special code telegram in which the information is of a more detailed character.

The daily flag signal message was sent to Saugor Island throughout the year and to Elephant Point from the 1st April 1909 to the 14th January 1910 only. This message was also sent to the Port Officer, Rangoon, during the period 15th January to 31st March.

During the past year arrangements were made at Diamond Island for the exhibition of the flag signals relating to the weather in the four sections of

the Bay of Bengal from 1st April to 14th January each year. The system was initiated on the 20th September.

The following officers were supplied with the flag signals and the daily weather telegram from 1st April 1909 to 14th January 1910:—

Port Officer, Rangoon.	Port Officer, Cuddalore.
Deputy Port Conservator, Rangoon.	Ditto, Negapatam.
Port Officer, Cocanada.	Port Conservator, Porto Novo.

Deputy Port Conservator, Madras.

At the request of the Secretary to the Port Commissioners, Rangoon, the daily weather telegram hitherto sent to his address was discontinued and the name of the Deputy Port Conservator, Rangoon, was added to the list of officers receiving the telegram. The Deputy Port Conservator, Rangoon, is also informed of all storms in any part of the Bay of Bengal.

The following officers received the daily weather telegram only during the period mentioned above, *viz.*, from 1st April 1909 to 14th January 1910:—

Port Officer, Moulmein.

Ditto, Akyab.

Ditto, Gopalpur.

Ditto, Vizagapatam.

The Port Officer, Chittagong, received the daily weather telegram and the flag signal message from 16th May to 15th November.

The telegram was also sent to the Port Conservator, Calingapatam, on Sundays, Wednesdays, and Thursdays.

49. The following officers were added to the list of officers receiving warning telegrams during bad weather or cyclonic storms :—

Superintendent of Telegraphs, South Indian Division, Trichinopoly.

Ditto, Eastern Bengal Division, Barrackpore.

Ditto, Arakan „ Akyab.

Ditto, Lower Burma „ Rangoon.

Director of Telegraphs, Construction Branch, Calcutta.

Executive Engineer, Lower Ganges Bridge, Damukdia.

Traffic Superintendent, Goalundo.

50. It has been decided to send to the daily papers for publication in the next morning's issue a note based on the storm observations recorded at 20 hrs., whenever a storm of importance is threatening Calcutta or the mouth of the Hooghly.

51. Arrangements were made in 1905 for the transmission by wireless telegraphy of the 8 hrs. observations from Port Blair and Slipper Island, and of special observations in the case of unsettled conditions in the Bay of Bengal. The service worked in a most satisfactory manner during practically the whole of the year 1909-10, and the information that it conveyed again proved of the greatest value in connection with the daily weather reports of Simla, Calcutta and Madras, as well as in the more important work of warning for storms in the Bay.

52. *Arabian Sea Storm Signal Service.*—The work of warning the Arabian Sea ports was carried out during the past year by the Simla Meteorological Office, which also warned the Madras ports on the Malabar coast in the same manner as the Meteorologist, Calcutta, warned the Madras ports on the coast of the Bay of Bengal. Warnings of storms in the Arabian Sea were also sent to the Port Officer, Aden, for the information of steamers leaving that port for the Superintendent, Colombo, Bombay and Karachi. Copies of all warnings sent to the Malabar ports were forwarded for information to the Master Attendant, Colombo, Meteorological Observatory, Colombo, the Commercial Agent to the Diwan of Alleppi, the Presidency Port Officer, Madras, the Deputy Port Conservator, Madras, and the Chief Engineer for Irrigation, Madras.

Warnings were also sent to the Dewan of Junagadh, the Superintendent of Telegraphs, Gujarat Division, the Sub-divisional Officer, Sacrifice Rock Lighthouse, Badagara, and indirectly through the Commander of the Port, Mormugao, to the Portuguese Port of Diu.

The following is a list of the Bombay and Malabar ports for the warning of which during the year 1909-10 the Simla Meteorological Office was responsible :—

I.—By extended system.	II.—By brief system.	
Karachi.	Cutch-Nandvi.	Murud Janjira.
Bombay.	Jamnagar.	Ratnagiri.
Mormugao.	Dwarka.	Harnai.
Mangalore.	Porbandar.	Mulwan.
Tellicherry.	Veraval.	Goa.
Calicut.	Jafrabad.	Vengurla.
Cochin.	Bhavnagar.	Karwar.
	Daman.	Kumta.
	Alibag.	Honavar.

53. In 1909-10 there were ten periods of disturbed conditions in the Arabian Sea for which warnings were issued, but only one was of importance. Early in May a depression crossed the south of the peninsula from the Bay of Bengal and on the 8th passed out into the Arabian Sea near Mangalore; thence it moved northwards to the vicinity of Gujarat and disappeared. Its high winds did much damage to native shipping at Calicut and considerable damage to bridges and roads in the inland portion of the district: in the other Malabar ports the damage to shipping was on a smaller scale.

54. In view of the entirely exceptional character of the weather and the success with which the departmental warnings were utilised in the South Canara district some further details are here given. At Calicut the warning from Simla of the approach of the storm arrived at noon on the 5th and after 1 P.M. the

wind gradually increased in strength until it became a gale with high seas: the storm raged heavily until the 7th by which time about 45 native boats had been wrecked. It is an open roadstead and there was nowhere to run to for shelter. At Mangalore however there is a backwater and it was possible on receipt of the warnings to make vessels secure in the harbour; consequently only two native boats were wrecked although on the night of the 7th it was blowing a hurricane with terrific squalls. The Collector of South Canara estimated the loss through wrecking of native boats in the district at between Rs. 50,000 and Rs. 70,000, and reported "were it not for the timely warning given to all the ports and to the divisional officers in the district who communicated it to the public, the loss of life and property would have been, perhaps, enormous."

55. Until the present year it has been considered that the local signs of the approach of the monsoon on the west coast were sufficiently marked, and that it was not necessary for this department to send warnings of the squally weather usually associated with its oncoming. In August last however it was decided that at such times telegraphic information should as far as possible be provided from Simla.

Flood Warnings and Weather Forecasts to District, Irrigation, Railway and other Officers.

56. This work is carried out chiefly by the Simla Meteorological Office, but partly by that of Calcutta. The arrangements for it have been sanctioned at various times, and differ considerably in character, according to the nature and extent of the flood or weather warnings required by the officers concerned. In some cases these officers require telegrams warning them of advancing storms likely to give heavy rain, or of actual heavy rainfall, likely to give rise to severe floods which might injure railways or canal works; and in others they require warnings or forecasts of the weather for as long a period beforehand as possible, so as to enable them to modify their arrangements for carrying on the works under their charge so far as may be necessitated by sudden or large changes of weather.

57. The number of district officers and officers in the irrigation, railway and other departments requiring warnings from Simla amounted at the end of the year to 93, an increase of 5 during the year.

This number does not include captains of mail steamers and other vessels who occasionally telegraph from Karachi, Aden and other ports for the latest intelligence respecting the position and movement of cyclonic storms, nor does it include the names of other individuals or firms who ask for special forecasts.

The number of special warning messages sent from Simla during the year 1909-10, was 941 as compared with 1,199 in 1908-09 and 1,149 in the year before.

58. Warnings of floods or of heavy rainfall were issued by the Meteorologist, Calcutta, to 41 officers of the Public Works, Telegraphs and other Departments, chiefly in Bengal and on the east coast.

59. Instructions were issued nine years ago by the Government of India that every officer to whom storm or flood warnings are issued, should in the month of January of each year or in the case of military expeditions at the close of the campaign, forward to the head of this department a brief return of the warnings received during the past year and should also report:—

(1) Whether the warning telegrams were rapidly transmitted and delivered by the Telegraph Department.

(2) Whether the warnings were timely and satisfactory in every respect, and, if not, in what points they were defective.

(3) Whether any changes might be made in the system which would make the warnings more useful.

Reports on the storm and flood warnings for the calendar year 1909 were received from 56 officers. Of these 29 reported that the warnings were timely and satisfactory and were rapidly transmitted by the Telegraph Department;

23 offered no remarks and 4 officers reported that they had received no warnings during the year. No suggestions were made for improving the usefulness of the Flood Warning Service.

The general impression given by the reports is that the system works as well as can reasonably be expected except in the forecasts of cold weather rainfall in Baluchistan. The information available for that area is inadequate, and arrangements are being made for opening new stations at Fort Sandeman, Kalat, Dalbandin, Panjgur and Pasni.

Seasonal Forecasts.

60. The forecast for the monsoon period of 1909, dated the 8th June, was sent to Local Governments and Administrations, communicated to the press and printed in the Gazette. A statement of the rainfall of June and July with a forecast for August and September was drawn up on the 6th August and published in a similar manner.

A statement of the actual rainfall during the monsoon period and a comparison of the two forecasts with actual rainfall was drawn up on the 16th December 1909 and sent to Local Governments and Administrations.

The chief points in the June forecast were (*a*) that the total monsoon rainfall would be of 'more than the average amount', and (*b*) that the 'outlook for the plains of northwest India during the early part of the season' was 'somewhat less favourable than that for the field of the Bay current.' Both of these proved to be correct.

The August forecast anticipated (*a*) a continuation of the favourable conditions with an excess of the total rainfall during August and September, and (*b*) no marked abnormalities in the geographical distribution of rainfall.

Of these (*a*) was somewhat too sanguine, for though the rainfall was very favourable from the agricultural standpoint its total for the two months was in defect by 2 per cent., (*b*) was fairly correct, for though individual provinces were in excess or defect there was no big excess or defect extending over a large area of the country.

61. A memorandum on the weather during November and December 1909, with a forecast of that of January and February 1910, was prepared on the 4th January and issued in the same manner as the forcecast of the previous June. The anticipation was that the total precipitation of northwest India would reach or exceed the average.

On the 5th May 1910 a comparison of the actual precipitation with the above forecast was issued, and it was pointed out that the number of depressions had been fully up to the average, though their tracks were farther north than usual: thus snowfall was as abundant as usual, but the rainfall in north-west India was in defect except in the North-West Frontier Province.

Daily Telegraphic Weather Summary.

62. The summary was despatched daily at about noon.

It was posted at certain telegraph offices, and sent to 87 servants of Government. The number of subscribers was as follows:—

Subscribers.	Number during monsoon period of 1909.	Number on 31st March 1910.
Newspapers	7	7
Private individuals ...	13	3

PUBLICATIONS.

A.—Weather Reports.

63. *India Weather Reports.*—The following weather reports, giving information of the current weather to the Government and the public, were published during the year by the Simla Meteorological Office:—

(1) India Daily Weather Report.

(2) India Weekly Weather Report, giving an account of the weather and of the rainfall of the week ending on the previous Thursday, published in the *Gazette of India* every Saturday.

(3) Monthly Supplement to the India Daily Weather Report, published about the 4th of the succeeding month.

(4) Annual Supplement to the Daily Weather Report.

(5) India Monthly Weather Review, giving a general summary of all the important features of the weather and complete meteorological data of the month; the data for this are not at once available and it is usually published three months after date.

(6) Annual Summary of the Monthly Weather Reviews.

For a detailed description of the contents of these publications reference may be made to the departmental Administration Report for 1907-08.

64. *India Daily Weather Report.*—The number of stations for which data were given in the daily report of the 31st of March 1910 was 176. The following table shows the distribution of the reports:—

	Number of Recipients on the 31st March.					
	1910.	1909.	1908.	1906.	1904.	1902.
Government Officers	514	509	461	416	398	372
Foreign Recipients	45	46	46	45	46	40
Newspapers	2	2	2	2	2	2
Subscribers	17	18	20	14	13	13
	578	575	529	477	459	427

The number of subscribers during the monsoon period of 1909 was 44.

65. *Annual Summary.*—The annual summary of the meteorology of India for 1908, supplementing the Monthly Weather Reviews for that year, was issued in October 1909. It contains mean data for the year and a discussion of its more important meteorological features together with their mutual relations. A summary of the meteorology of the year 1908 was also prepared for the Sanitary Commissioner with the Government of India, and was given as Chapter I of the Annual Report of that officer for the year.

66. *Special Charts.*—The Simla Office prepared, throughout the year, weekly charts showing the character of the rainfall of each week and of the seasonal rainfall up to date, for the use of His Excellency the Viceroy, His Majesty's Under-Secretary of State for India, London, the Hon'ble the Finance Member and the Secretary to the Government of India in the Revenue and Agricultural Department.

67. *Provincial Weather Reports.*—The following provincial reports were issued by the local meteorologists during the year:—

(1) By the Meteorologist, Calcutta—

(*a*) Calcutta Daily Weather Report.

(*b*) Meteorological Table for Bengal and Assam, with a summary of the chief features of the weather for the month, published regularly in the *Calcutta Gazette.*

(*c*) The supplementary weekly meteorological and rainfall table containing temperature and rainfall observations recorded at 19 stations in Bengal and in Eastern Bengal and Assam, issued to all subscribers of the Calcutta Weather Report on every Wednesday throughout the year.

(2) By the Meteorologist, Bombay—

(*a*) Bombay Daily Weather Report.

(*b*) Monthly abstracts of meteorological observations published in the Bombay Government *Gazette.*

(3) By the Meteorologist, Madras—

(*a*) Madras Daily Weather Report.

(*b*) Monthly Rainfall Tables for Madras, Coorg, Pudukkottai, Cochin and Travancore, published in the Provincial *Gazette.*

(4) By the Meteorologist, Allahabad—

(*a*) Monthly Weather Summary of the province published in the Provincial *Gazette.*

(*b*) Brief sketch of the meteorology of the province for the year 1908

(*c*) Monthly Rainfall Tables for the United Provinces of Agra and Oudh, published in the Provincial *Gazette.*

(5) By the Simla Office—

(*a*) Monthly Summary of the weather of the Punjab, published in the Provincial *Gazette.*

(*b*) Annual Meteorological Summary of the Punjab for the year 1908-09.

B.—Memoirs of the Indian Meteorological Department.

68. The following were published during the year 1909-10 :—

(1) A discussion of the anemographic observations recorded at Roorkee, from September, 1879, to August, 1904; at Lahore from June, 1889, to May, 1905; and at Mussooree from May to October, 1877—1888, by the late Sir John Eliot, M.A., F.R.S., K.C.I.E., late Meteorological Reporter to the Government of India and Director-General of Indian Observatories. (Memoirs of the Indian Meteorological Department, Vol. XVIII, Part IV.)

(2) A discussion of the anemographic observations recorded at Pachmarhi from September, 1883, to April, 1887, and at Nagpur from January, 1882, to December, 1902, by the late Sir John Eliot, M.A., F.R.S., K.C.I.E., late Meteorological Reporter to the Government of India and Director-General of Indian Observatories. (Memoirs of the Indian Meteorological Department, Vol. XIX, Part I.)

(3) The Simla seismograms obtained between June, 1905, and November, 1908, by J. Patterson, M.A., Imperial Meteorologist. (Memoirs of the Indian Meteorological Department, Vol. XX, Part III.)

(4) On the meteorological evidence for supposed changes of climate in India by Gilbert T. Walker, M.A., Sc.D., F.R.S., Director-General of Observatories. (Memoirs of the Indian Meteorological Department, Vol. XXI, Part I.)

C.—Other Publications.

69. (1) Telegraphic Code and instructions for the use of the Indian Meteorological Department during stormy and suspicious weather (second edition).

(2) Tables for the reduction of meteorological observations in India (revised and enlarged edition).

Supply of Meteorological Information.

70. In addition to the meteorological information published by the department the following special information was supplied to other meteorological institutions :—

(*a*) Weekly telegrams containing weekly pressure departures from normal of Bombay, Seychelles, Zanzibar and Aden were sent to the Director General, Survey Department, Cairo, during the monsoon period.

(*b*) Monthly telegrams were sent to the Meteorological Office, London, during the monsoon period giving information of the state of the Arabian Sea and Bay of Bengal for insertion in their monthly pilot charts.

(*c*) Monthly telegrams were sent to the Solar Physics Committee, London, throughout the year giving the mean monthly pressure of Bombay.

(*d*) Monthly telegrams were sent to the Meteorological Department, Melbourne, Australia, throughout the year giving the monthly mean pressure and temperature departures from normal of India, and a short description of the general condition of weather.

(*e*) Weekly code telegrams were sent during the monsoon period from Simla to the Calcutta Meteorological Office for drawing up a table of rainfall, humidity and temperature at 100 representative stations in India, to be published by the Director General of Commercial Intelligence in the *Indian Trade Journal.*

71. Climatological information, at times involving special calculation, is also provided for sanitary and other officers of Government, as well as to private firms. The extent to which the Department is utilised in this manner is increasing steadily.

Miscellaneous.

72. Nine hundred and eight books and pamphlets, either purchased or presented by scientific bodies, were added to the Library during the year. The Library is on the whole in fair order.

73. Thirteen libraries, observatories or societies were added during the year to the list of institutions to which the publications of the India Meteorological Department are supplied, and six were removed; the number on the list is now 384.

Chief Features of the Year.

74. The work of the department falls naturally into two parts, the directly useful and the purely scientific which aims at ascertaining facts which shall be of practical usefulness in future. The former part consists chiefly of the collection and distribution of current weather information, the supply of climatological data, the sending of storm and flood warnings and the provision of time signals. On the other hand the scientific work includes the experimental and theoretical examination of the physical processes, on the earth or the sun, which determine the weather.

Owing to the abnormally large number of violent storms during the year the work of notifying the ports assumed exceptional importance. Information regarding the usefulness of the warnings of the storm in May on the Malabar coast has been given in paragraph 54. In the Bay of Bengal the most important storms were those which struck Goalundo and Gopalpur in October and Cox's

Bazar in December. The Meteorologist, Calcutta, was on leave from March to December and the warnings issued by his substitute were very useful; in spite of the unusual characters of the storms he formed fairly correct estimates of their paths. But considering the enormous interests at stake it may be doubted whether a system is adequate which may place work of this difficult and fatiguing nature into the hands of a comparatively inexperienced half-time officer who has other important duties to attend to. Perhaps the chief difficulty in the past in ascertaining the position and magnitude of a storm in the Andaman Sea has been the bad exposure of the wind instruments at Mergui, Tavoy and Moulmein, and the entire lack of information as to the state of the sea along the Tenasserim coast. A tower for the wind instruments has therefore been erected at Tavoy and the observatory at Mergui has been transferred to the wireless telegraph station; a new observatory has been opened at Victoria Point at the extreme south of Tenasserim, and arrangements have been made for a station at Amherst, near Moulmein, which shall telegraph the state of the wind and sea.

The work of issuing predictions of heavy rain to officers requiring it, or information of unusual precipitation which has actually occurred, has been in general carried out with as much success as can reasonably be expected. The only district where the system has seemed unsatisfactory has been Baluchistan, and there our stations, Quetta and Chaman, have not been nearly adequate to represent the area: the head of the department accordingly visited Quetta and availed himself of the keen interest in meteorological matters of the Agent to the Governor General who agreed to the starting of five new telegraphically reporting stations, and to their regular inspection by his officers. An observatory has been started at Jagdalpur and is of considerable importance when depressions from the Bay are passing into the Central Provinces; and, on the other hand, savings have been effected by the closing of the observatories at Car Nicobar, Cocos Island, Fraserganj, Pachpadra and Periyakulam, from which the data had become unnecessary or worthless.

A conspicuous growth in the departmental correspondence has occurred in connection with requests for information, in general of a statistical character, from officers interested in the relations of weather and disease, or from commercial firms wishing to start factories requiring special conditions. The amount of work involved has at times been considerable.

Turning to more directly scientific work, progress has been made by Mr. Field in his examination of the conditions in the upper air. Almost every civilised country is now conducting regular observations with balloons or kites and as the monsoon is brought by one of the largest of the air currents it is of importance for India that knowledge should be gained of the factors determining the general circulation. The work of the year, described in paragraph 21, has brought out a striking difference between the upper winds in the rains and in the cold weather; and it is hoped that the Indian clerk who has been trained to calibrate the instruments and send up the balloons may enable observations to be made regularly in future.

The experiments upon which Dr. Simpson had based his explanation of the electricity in thunderstorms were repeated during the year and were applied to snow storms; the electrification in the latter case was found to be produced under conditions generally similar to those in the case of rain.

It has at times been maintained that the climate of northwest India was changing owing to the increase in the extent protected by canals, or to the destruction of forests; and a memoir was published during the year in which the meteorological evidence was examined. It appears that the rainfall records give no justification for believing in a permanent change, and that for such temporary variation as has occurred during the past 40 years human agency is not responsible to any appreciable extent. This conclusion is not, of course, opposed to the fact that the destruction of forests in India leads to the washing away of valuable soil, and so causes the rainfall to run off more rapidly into the rivers and to be less useful for the growth of crops.

Fresh advances have been made at Kodaikanâl in our knowledge of conditions upon the sun, and a summary of the recent important researches has been published as the first of the memoirs of the observatory. Mr. Evershed has established the existence of an inward movement of the gases above a sunspot, in addition to the outward movement of the lower gases previously announced.

The department has for three years lost the services of Dr. Simpson. The Royal Society regarded him as the most useful officer fitted to take charge of the physical researches to be made during the approaching attempt to reach the South Pole, and on their application he was granted the necessary extraordinary leave. The temporary vacancy is being filled by Mr. Harwood, who, like Dr. Simpson, was formerly a pupil of Professor Schuster of Manchester.

Concluding Remarks.

75. The Meteorological Department again received valuable assistance in its work from the Medical, Telegraph and Postal Departments during the year.

76. The importance of collecting meteorological information has always been realised by medical officers in India, and many of our observatories are in hospitals with the Civil Surgeon as our Superintendent. As the work of seeing that the observer performs his duties properly is entirely unpaid, our thanks are specially due to the officers of the Medical Department.

77. The Telegraph Department has continued to assist the Department by the rapid transmission of daily weather telegrams, and of storm and flood warning telegrams. There are in all 23 observatories established at departmental telegraph offices, the observation being taken either by the telegraph master or by a signaller, and except at a few stations the observations were satisfactory throughout the year.

78. By permission of the Postal Department meteorological observatories are established at eighteen combined postal and telegraph offices. Observations at the great majority of these stations are taken by one of the telegraph signallers, but in one or two cases by the postmasters. With certain exceptions these observatories also worked satisfactorily during the year.

79. Daily weather telegrams from Aden were sent free of charge to Bombay by the Eastern Telegraph Company during the year, and the Department is greatly indebted to the Eastern Telegraph Department for this valuable concession as well as for the rapid transmission of the messages.

80. The observatories at Baghdad, Ispahan, Tehran, Meshed, Muscat, Jask and Bushire furnished valuable observations throughout the year. Daily weather telegrams were transmitted as far as Karachi, free of cost to the Department, from Muscat, Bushire and Jask throughout the year, and from Meshed, Ispahan, Tehran and Baghdad from the beginning of November to the end of the official year. These telegrams were forwarded from Karachi to Simla in the same manner as Indian weather telegrams, and were very useful in forecasting the approach of cold weather storms from Persia to northern India. The Department is greatly indebted to the Directors of the Persian Gulf Section and of the Persian Section of the Indo-European telegraph line for the continuance of this valuable concession.

81. Weekly telegrams were received from the 1st May to the 23rd October from the Director of the Royal Alfred Observatory, Mauritius, as well as from the departmental observatories at Zanzibar and Seychelles. These telegrams gave valuable information of the weather conditions in the Indian Ocean and the Department is indebted to the officers for the punctual transmission of the information. Thanks are more specially due to the Director of the Royal Alfred Observatory for his courtesy in placing the meteorological data of that observatory at the disposal of the India Meteorological Department.

82. The Department is greatly indebted for important information, as to meteorological conditions prevailing antecedent to and during the south-west monsoon, to the Director of the Government Observatory, Durban; the

Director, Agriculture and Forestry Department, Zomba, British Central Africa; the Meteorologist, Dar-es-Salaam; His Majesty's Commissioner, Entebbe, Uganda; the Director General, Survey Department, Cairo; the Commonwealth Meteorologist, Melbourne; the Directors of the Observatories at Buenos Ayres and Santiago; and to the various officers around the Indian frontiers who have collected and supplied valuable snowfall information.

GILBERT T. WALKER,

Director General of Observatories.

METEOROLOGICAL OFFICE, SIMLA;

The 9th September 1910.

G. G. B. P., Simla.—No. 286 M. R. G. I.—30-8-10.—280.—R. G. G.

REPORT

ON

THE ADMINISTRATION

OF

THE METEOROLOGICAL DEPARTMENT

OF

THE GOVERNMENT OF INDIA

IN

1910-11.



CHANGES IN THE STAFF DURING THE YEAR.

Mr. W. A. Harwood was appointed to act as Imperial Meteorologist for three years from the 15th April in place of Dr. Simpson on leave without pay.

2. Mr. R. Ll. Jones went on leave from the 29th April to the 9th of July, Mr. E. B. Ross acting.

3. Dr. E. G. Hill went on leave from the 29th April to the 3rd of November, Mr. J. J. Durack acting.

4. Mr. J. Patterson resigned his post of Imperial Meteorologist from the 6th May.

5. Mr. J. Evershed went on privilege leave from the 20th May to the 19th of August.

6. Mr. J. H. Field went on privilege leave from the 7th December to the 20th December.

7. Mr. C. Michie Smith retired on pension from the 13th January, but was kept on special duty at Kodaikanal till the 31st March.

8. Mr. T. Royds was appointed Assistant Director, Kodaikanal Observatory from the 28th February.

OBSERVATORIES.

9. The observatories maintained by the Government of India are classified as follows :—

First Class.—Observatories which are furnished with autographic instruments for continuously recording pressure, temperature, humidity, and wind direction and velocity, in addition to instruments read by eye.

Second Class.—Observatories at which readings are taken daily at 8 hrs., 10 hrs., and 16 hrs. : those at 8 hrs. are (with a few exceptions) transmitted by telegram to one or more of the offices at Simla, Calcutta, Bombay and Madras for inclusion in the India or Provincial Daily Weather Reports.

Third Class.—Observatories—

(*a*) where readings are taken daily at 8 hrs. only; in those stations where there are telegraph offices the observations are transmitted by telegram for inclusion in the Simla, Calcutta, Bombay or Madras Daily Weather Reports;

(*b*) at stations where there are no telegraph offices, and observations are recorded at 10 hrs. and 16 hrs. only; these are included in the Monthly Weather Reviews, and furnish a series of observations for the determination of monthly and daily means which should be comparable with the means already obtained for second class observatories.

Fourth Class.—Observatories at which observations of temperature, wind and rainfall only, or of temperature and rainfall only, are recorded.

10. At the end of the year the total number of observatories was 283 of which 51 were non-departmental and 232 were maintained by the Government of India. Of the 232 departmental observatories, 7 were first class, 20 second class, 181 third class and 24 fourth class.

11. The changes in non-departmental observatories during the year were the following:—

(1) A fourth class observatory was opened at Jammu on the 1st May 1910 under the superintendence of the Meteorological Reporter, Jammu and Kashmir State, Srinagar.

(2) The third class observatory at Parachinar was changed from non-departmental to departmental on the 18th March 1911.

12. The following were the changes in departmental observatories during the year:—

(1) third class observatories were opened at Victoria Point and Pasni on the 5th May 1910 and 19th January 1911, respectively.

(2) fourth class observatories were opened at Guntur and Anantapur on the 8th April 1910 and 12th August 1910, respectively.

(3) The third class observatory at Kailang was changed to fourth class on the 1st June 1910.

First Class Observatories.

13. The Directors of the Observatories of Kodaikanal, Madras and Bombay publish separate annual reports which are forwarded for the information of Government. It has accordingly been ruled as unnecessary to include information relating to the working of these observatories in this Administration Report.

The following autographic instruments were in use at the different first-class observatories during the year 1910-11.

Alipore.	Allahabad.	Lahore.
Bergholz barograph.	Beckley anemograph.	Draper barograph.
Kew barograph.	Richard barograph.	Richard barograph.
Kew thermograph.	Richard thermograph.	Casella rain-gauge.
Richard thermograph.	Stokes sunshine recorder.	Beckley anemograph.
Beckley anemograph.	Solar radiation thermometers.	Sunshine recorder.
Dines' pressure anemometer.	Grass thermometer.	Grass thermometer.
Beckley rain-gauge.	Ground thermometer.	Nephoscope.
Monthly rain-gauge.	Nephoscope.	
Hellman Fuess rain-gauge.		
Milne seismograph.		

The Alipore Observatory.—This observatory is under the charge of the Meteorologist, Calcutta.

The autographic instruments have on the whole worked satisfactorily during the past year.

All instruments issued by the Meteorological Department are tested at this observatory and their corrections ascertained before they are sent out for use. The number of instruments tested and verified during the year was 1,098 as compared with 598 last year. Nineteen instruments were condemned as unfit for issue, or were sent to the India Office for repair and 12 instruments were kept in store for future treatment. In addition to the above instruments numbering 324 were examined before issue to other observatories.

The observatory gives mean Calcutta time to the port and shipping. Three time balls are dropped daily at 1 P.M. local mean time throughout the year, one on the Semaphore Tower at Fort William, the second at the Port Commissioners' office and the third at the Kidderpore Docks.

This work was carried out satisfactorily on the whole; there were 21 failures as compared with 13, the average number of the past 22 years; in all cases they were due to defects in the electric or mechanical arrangements outside the observatory.

Year.	Number of days on which one or other ball failed to drop properly.	Number of failures due to telegraphic defects.
1910-1911	21	20
1909-1910	28	27
1908-1909	18	18
1907-1908	10	10
1906-1907	25	24

The Allahabad Observatory.—This observatory is under the charge of the Meteorologist, Allahabad.

Beckley anemograph.—The instrument worked well throughout the year, except on thirteen occasions when short breaks occurred in the trace.

Dines' pressure anemometers.—The two pressure tube anemometers which were temporarily removed to the Muir College for experimental purposes have been returned to the observatory.

Richard barograph.—This instrument gave excellent tracings throughout the year. All the charts have been tabulated.

Richard thermograph.—The wet bulb tracings of the thermograph have not been very satisfactory, but the dry bulb tracings, with a few exceptions, have been good.

Sunshine recorder.—This worked continuously well.

Nephoscope.—Regular observations of clouds have been made.

Readings of all the eye instruments were taken every two hours, from 6 hrs. to 22 hrs. The earth thermometer on the surface was read at 6, 14 and 22 hrs.

The Lahore Observatory.—Eye observations of the ordinary meteorological instruments were taken seven times daily at this observatory as in past years, at 6, 8, 10, 14, 16, 18 and 22 hrs. Ground surface temperature was recorded four times daily, at 6, 10, 16 and 22 hrs.

Character of the work of observation at Second and Third Class Observatories.

14. The general character of the work of the observatories, as judged by the number of mistakes made by observers, appears to have been satisfactory. The number of stations of great reliability, in which either no mistake or only one has been detected in the data for the Indian Daily Weather Report, was 38 as against 18 last year, while the number of stations at which more than 50 mistakes were made was again 11.

The usual list showing the number of mistakes in observation and in the preparation of telegrams for all the observatories which send weather telegrams to the Simla office, was prepared and circulated to the observatories at the end of the year under review.

Inspection of Observatories.

15. The number of visits paid to observatories during the year was 58 as compared with 46 in the previous year and an average of 70 during the past 10 years. The absence on leave of several officers during the touring season accounts for this diminution from the average.

The Director General inspected the observatories at Calcutta, Bombay, Madras, and Kodaikanal; Mr. Gaetane inspected 31; Mr. Subrahmanyam 7; Babu Budha Mull 2; Mr. Hem Raj 6; Mr. C. Chengaloaraya Mudeliar 5; and Mr. W. A. Bion 7.

Karwar was inspected twice and the visit to Pasni was made to establish the station, so that the actual number visited was 57; of these, 23 were reported as good, 31 as tolerable and 3 as bad.

Condition.	Number of observatories inspected in					
	1910-11.	1909-10.	1908-09.	1907-08.	1906-07.	1905-06.
Good or satisfactory ...	23	25	40	43	68	48
Tolerable	31	11	20	18	6	13
Bad	3	4	2	10	5	4
Total ...	57	40	62	71	79	65

In estimating the general character of the observatories from the above table it must be remembered that it is, as a rule, on account of something unsatisfactory that a visit of inspection is made. The general level of the stations is thus decidedly better than might otherwise appear. The most frequent cause of bad work is the changing of observers at short intervals necessitated by acting and other arrangements in the Medical, Telegraphic and Postal Departments.

The observatories under the control of the Meteorologist, Calcutta, numbered on the 31st March, 71 *viz.*, 1 second class, 50 third class, 19 fourth class stations and 1 voluntary observatory; and of these 19 were inspected during the year by Mr. Gaetane and are included in the above statement. The observatories under the control of the Meteorologist, Bombay, numbered 23 *viz.*, 2 second class and 21 third class, and of these 7 were inspected.

Special Observations.

16. Observations other than those recorded at regular intervals are made as follows:—

(*a*) In response to requests from the Simla or Calcutta office, when weather is disturbed and storm warnings may have to be issued: such observations are always sent by telegraph. Certain observers at coast observatories are in receipt of a regular monthly allowance of Rs. 5 for sending special storm warning telegrams, while other observers receive an allowance of Re. 1 for each set of special observations sent at the request of either Simla or Calcutta. The number of telegrams of the latter class forwarded during this year was 648, as compared with 434 last year.

(*b*) Certain observers have been empowered, when they consider that conditions at sea are sufficiently threatening, to send of their own initiative to Simla or Calcutta a telegram containing special observations. No occasion of this type occurred.

(*c*) In connection with flood warning a number of observers have been instructed to send telegrams announcing the occurrence of heavy rainfall to Government officers and railway engineers who desire early information. The number of telegrams so sent was 108 as compared with 69 last year.

(*d*) Observers are instructed to send detailed information of earthquakes to the Simla Meteorological office and to the Director, Geological Survey, Calcutta: for this work they are paid awards from this department. 95 reports were received during the year in Simla.

Observations with special Meteorological Instruments.

17. The following special observations were carried out during the past year at certain selected stations:—

1st.—Wind observations recorded by Beckley anemographs at 14 stations, and by Dines' pressure tube anemometers at 5 stations.

2nd.—Solar and terrestrial radiation observations at 2 and 12 stations respectively.

3rd.—Underground temperature observations at 3 stations.

4th.—Sunshine observations at 9 stations.

5th.—Barometric observations recorded by self-registering instruments, chiefly Richard barographs, at 36 stations.

6th.—Temperature observations recorded by self-registering instruments, chiefly Richard thermographs, at 18 stations.

Observations of Solar Energy in Absolute Units.

18. Observations were continued at Simla and Kodaikanal throughout the year, when weather conditions allowed, by means of Angstrom's Electric Pyrheliometer.

Observations in the Upper Air.

19. Owing to the changes in the gazetted staff of the department and to absence on leave, the progress of current researches was slow and little new work was possible.

The Indian observer who had been under training, as mentioned last year, was sent to Jhang in May with facilities for carrying on work with pilot balloons and recording balloon-meteorographs. His work of the former type was satisfactory and involved the use of theodolites for determining the strength, thickness, and directions of winds in the several air layers passed through by the balloons.

In regard, however, to recording meteorographs sent up on balloons, it was found that the many trifling difficulties which must necessarily arise in research operations were insuperable by correspondence, and after long trial it was reluctantly concluded that the work demanded a greater knowledge of the principles of the instruments and of the essential objects of the investigation than could be expected of an observer without a scientific education. The value of the pilot balloon observations alone was considered insufficient to justify the expenditure on the existing establishment, and the work was consequently brought to a close on the 31st March 1911.

Steps are now being taken to secure the necessary personal supervision of an organising officer during a considerable portion of the year, and it is hoped that the experimental investigation may be resumed in 1913 at Allahabad. The work will be directed chiefly towards determining the extent to which enquiry in the upper atmosphere may be expected to throw light on the problem of monsoon and other forecasting.

During the course of the pilot balloon ascents at Jhang, similar balloons were liberated on many days in Simla, and this practice was continued after the closing of the Jhang establishment.

The work of analysing the observations which have already been made is progressing, and it is hoped that it will be possible to publish the results of the analysis in the course of the year 1911-12.

Seismograph Observations.

20. Seismological observations were recorded by two Omori-Ewing seismographs at Simla, and one at Bombay; by Milne seismographs at Alipore (Calcutta), Kodaikanal and Colaba (Bombay); and by means of other self-registering instruments at the last named station. All the instruments worked satisfactorily throughout the year, and copies of the records of the Milne's seismographs were transmitted to the Seismological Committee of the British Association.

Atmospheric Electricity.

21. The Benndorf self-registering electrometer at Simla, was maintained in good order and gave a fairly continuous record of the potential gradient from 1st April 1910 to 4th January 1911, when the observations were discontinued for the remainder of the year.

Marine Meteorology.

22. No change was made during the year under review in the method of collecting marine information.

At Calcutta and Bombay a clerk at each port spends his whole time in visiting ships, making in each case a copy of the log and a comparison of the ship's barometer with a secondary standard, for the purpose of applying the necessary corrections to the readings in the logs; and, after the barometer comparisons have been tabulated in the Calcutta or Bombay office, a statement of the error of the ship's barometer is posted to the captain, in case he should desire to make use of it. The number of ships visited is materially less than that of the vessels which come into port, but it is ample for the purposes of the department.

The data thus obtained are utilised in the prepartion of charts of disturbances in the Bay of Bengal and the Arabian Sea for future reference in connection with the storm warning work of the department, and in drawing up an account of the storms of the year for publication in the Annual Summary.

The arrangements made with the London Meteorological Office, the Royal Alfred Observatory at Mauritius, and the Deutsche Seewarte, Hamburg, for collecting marine data from the whole of the Indian Ocean, have been continued, and the thanks of this Department are again due to these three offices for thus supplying a large amount of useful data.

Observations recorded during the year at the entrance of the River Hugli were supplied to the Meteorological Department by the light-vessels "Fame", "Comet" and "Luna."

Snowfall Registration in the Mountain Districts to the North and West of India.

23. The information as to the amount, distribution and time of occurrence of the snowfall in the Himalayan and Afghan mountain areas was on the whole tolerably complete, and the thanks of the Department are again due to the various officers who have collected and forwarded it. Reliable additions to the information received have been obtained by continuing, though from a lower altitude, the series of large-scale photographs of the snows, as seen from Simla, which were started in 1905.

Rainfall Registration.

24. The registration of rainfall in India has invariably been carried out by the provincial authorities. In 1889 a uniform system was introduced by the Government of India, and the Director General of Observatories was made consulting officer in connection with this work. His advice is sought regarding the starting of new raingauge stations, and he receives annual reports from the local officers responsible for the registration of rainfall upon the efficiency of the work. A general account of the system which came into operation in the year 1891-92, will be found on pages 5—8 of the Administration Report of the year 1889-90, and on pages 6, 7 of the Administration Report of the year 1890-91.

The following is a classified statement of the total number of raingauge stations at the end of the year in the various political divisions, and of the number of rain-gauge

stations of which inspection reports were received by the Indian Meteorological Office during the year 1910-11.

Province or Division.	Number of rain-gauges supplying returns for publication on 31st March 1911.	Number of inspections of rain-gauges in 1910-11 of which copies of the reports were received in the Simla Meteorological Office.				Percentage of inspections of which copies of reports were received, to total number of rain-gauges.
		Good.	Fair.	Bad.	Total	
Burma	192	6	7	...	13	7
Eastern Bengal and Assam ...	246	42	12	2	56	23
Bengal	353	38	6	1	45	12
United Provinces	278	29	5	2	36	13
Punjab	189	46	10	3	59	31
Kashmir	36	...	...	...	...	...
North-West Frontier Province ...	33	6	1	...	7	21
Baluchistan	70	...	...	...	...	...
Rajputana	185	8	...	...	8	4
Bombay and Sind	289	...	...	...	...	...
Central India	114	...	...	...	...	...
Central Provinces	171	38	10	...	48	28
Hyderabad	22	...	...	...	...	...
Mysore	77	...	...	...	...	...
Madras (including Pudukkottai, Coorg, Travancore and Cochin).	499	265	131	25	421	84
Total ...	2,754	478	182	33	693	25

NOTE—In several cases the same gauge was inspected more than once during the year.

The following paragraphs give a brief summary of the reports of rainfall registration for the year 1910-11 :—

Burma :—The total number of rain-gauge stations in the Province is 192, as at the close of last year. Of these 14 are meteorological observatories, and 26 are under the charge of the Public Works Department. The total number of rain-gauges inspected was 168, a decrease of 18 against the inspections made last year. Of these 159 were reported in good condition, 5 as fair and 4 as bad. The positions of the gauges are generally good, and where defects have been pointed out District Officers have been addressed with a view to remedying them. A new raingauge station at Lewege in the Bhamo District was sanctioned during the year. The returns are received punctually, and the inspections are satisfactory.

Eastern Bengal and Assam :—The total number of rain-recording stations was 247 or the same as last year, one new station having been opened in the Pabna district and one closed in the Khasi and Jaintia Hills. The statement giving the number of raingauges inspected shows 137 inspected and 109 not inspected. From a comparison with the similar statement for 1909-10 it would appear that the number of inspections has decreased by 26 and that nearly one-half of the gauges were not inspected during the year. The amount of inspection was particularly inadequate in the districts of Chittagong, Chittagong Hill Tracts, Hill Tippera, Mymensingh, Bakarganj, Dinajpur, Sylhet, Goalpara, Kamrup, Darrang and Sibsagar, where less than half the number of gauges were visited. The districts are now much better supplied with the proper equipment of gauges, etc., than they were two or three years ago, and steps are being taken to remedy such defects as still remain.

Bengal.—The number of stations on the 31st March 1911 was 328, and the number of stations inspected was 87, an increase of 13 as compared with the previous year. No stations were inspected in the districts of Hoogly, Muzaffarpur, Bhagalpur, Darjiling, Balasore, Puri and Ranchi.

United Provinces:—There are 288 rain-reporting stations in these Provinces, including the meteorological observatories. All are equipped with gauges of the Symons pattern. Out of the 274 stations under District and Canal officers' supervision 146, *i.e.*, 53 per cent, were reported as inspected during the year. In the districts of Gonda, Sitapur, Rai Bareilly and Benares all the rain stations were inspected during the year, while on the other hand in the districts of Bara Banki, Sultanpur, Partabgarh, Hardoi, Muttra, Pilibhit, Shahjahanpur, Budaun, Muzaffarnagar and Ballia only one station in each has been reported as inspected, and in Jaunpur and Etah no station at all. Four rain-gauges were removed to new sites, and continuous efforts are being made to secure good exposures for the gauges and to provide for their proper inspection.

Punjab:—The total number of rain gauges in the Punjab was 208, or 5 more than last year. Of these 154 are under the District Officers and 54 under the Canal Department. New rain gauges were established at Abohar, Ferozepur district, at Singhapur and Sanghi in the western Jamna Canal circle, and at Satghara and Gamber in the Lower Bari Doab Canal circle.

The rain gauges at Budhlada and Hissar have been changed to more suitable situations.

The different Revenue officers reported 62 inspections, as against 108 in the preceding year. In addition to this the Deputy Commissioners, Lahore, Gurdaspur, Delhi and Muzaffargarh made several inspections of which however no post card inspection reports were submitted. No post card inspection reports were received from Karnal, Sialkot, Jhelum or Lyallpur nor were any rain gauges inspected in the Simla district. The rain-gauges under District Officers are reported to be in good order and the rainfall records accurately kept.

From reports received from Canal Officers it would appear that all the raingauges under their charge have been inspected and have been kept in good order throughout the year, although the Watson's gauges appear to give a good deal of trouble, and often to get out of order. The rainfall records are reported to have been properly kept.

Kashmir.—No report has been received.

North-West Frontier Province.—No report has been received.

Baluchistan.—No report has been received.

Rajputana.—No report has been received.

Bombay and Sind.—The total number of raingauges reporting rainfall in the Presidency and Native States was 336, the same as last year.

Out of the 275 raingauges in the Presidency, 200, or about 73 per cent., were inspected during the year; 85 of these were inspected more than once and the total number of inspections amounted to 308 as compared with 282 in the year 1909-10. Sufficient attention does not appear to have been paid to the work of inspection in six districts in the Deccan, in one each in the Karnatak, Konkan and Gujarat, and in three in Sind. The attention of the collectors concerned is being invited to it.

In the Native States the improvement in the work of inspection mentioned in last year's report has not been maintained. Forty out of sixty-one rain gauges, or nearly 66 per cent., having been inspected this year as against forty-three or nearly 70 per cent. last year. One gauge was inspected more than once, and the total number of inspections amounted to 43 as against 51.

Central India.—No report has been received.

Central Provinces.—The number of raingauges maintained during the year was 108, against 107 in the previous year. The number of inspections of raingauges during the year, of which reports were received, was 130, against 125 in 1909-10 and 148 in 1908-09. The raingauges at nine stations were not inspected during the year. Most of the defects detected were slight and were remedied on the spot.

Berar.—No raingauge was established or abolished during the year so that the number of raingauges remained 44, 4 being at observatories under the control of the Meteorological Department.

The number of inspections of raingauge stations was 140 against 154 in the previous year. The general results were satisfactory.

Hyderabad.—No report has been received.

Mysore.—Five new rain-gauge stations were opened during the calendar year 1910, so that at the close of the year the total number of Government stations was 227, exclusive of those maintained by a few coffee planters in their respective estates. There was a very creditable improvement in the number of inspections during the year the total being 195 out of 227, or 85·9 per cent., as against 73·9 of the previous year.

Madras.—On the 31st March 1910 there were 476 rain-recording stations (excluding those at meteorological observatories) furnishing rainfall returns for publication in the Fort St. George Gazette. The raingauges at Kota in the Nellore district, and at Ramallakota in the Kurnool district, were abolished during the year, and two other rain-recording stations were transferred from the Revenue Department to the Meteorological Department; on March 31st 1911 there were 472 rain-recording stations, *viz.*, 388 in Madras Presidency and 84 in the Native States. Of the 388 rain stations in the Madras Presidency 365, or 94 per cent. were inspected. The inspection work in Madras continues most satisfactory.

Summary.—The work of rainfall registration continues to be carried on in a satisfactory manner. In Baluchistan, in Central India and in other parts of the country the work has been placed upon a more satisfactory footing, and there is general evidence of increased realization of the need of regular inspection if reliable results are to be secured.

Storm Warnings.

25. The work of warning Indian ports of the approach of cyclonic storms or of bad weather is performed from the Simla Office by the Director General of Observatories, and from the Calcutta Office by the Meteorologist, Calcutta.

The system at present in operation includes:—

1st.—An extended system of storm signals for use at the larger and more important ports.

2nd.—A brief system of storm signals for use at the smaller ports, chiefly for the information of native vessels and local traffic.

26. *Bay of Bengal Storm Signal Service.*—The ports in the following table are so arranged as to show at a glance the respective duties of the port authorities and the Meteorologist, Calcutta, in the matter of hoisting and lowering storm signals:—

Storm signals hoisted and lowered by order of Meteorologist, Calcutta.	Storm signals hoisted and lowered at the discretion of the port authority, the duty of the Meteorologist, Calcutta, being limited to giving detailed information of storms.	Storm signals hoisted and lowered by the port authorities, the Meteorologist, Calcutta, suggesting the particular signal to be hoisted.		Warnings only are sent by Meteorologist, Calcutta.
Calcutta.	Barisal.	Madras Ports.	Burma Ports.	Colombo.
Budge Budge.		Gopalpur.	Akyab.	
Mud Point.		Calingapatam.	Bassein.	
Diamond Harbour.		Vizagapatam.	Rangoon.	
Saugor Island.		Cocanada.	Moulmein.	
Chandbali.		Masulipatam.	Tavoy.	
False Point.		Madras.	Mergui.	
Balasore.		Cuddalore.		
Puri.		Negapatam.		
Chittagong.		Pamban.		
Cox's Bazar.		Tuticorin.		
Narayanganj.				
Goalundo.				
Morelganj.				
Noakhali.				
Diamond Island.				
Table Island.				
Port Blair.				

The following gives a short statement of the storms which affected the Bay of Bengal Coasts during the year 1910-11.

Number of storm.	Period of depression or storm.	Character of storm.	Coast affected.
1	13th to 16th April ..	On the 9th and 10th weather was slightly disturbed in the south-east of the Bay, and a depression formed in the neighbourhood of the Adamans on the 11th which developed into a storm on the 13th. It continued to grow during the next two days moving slowly north-east-wards, and by the morning of the 15th developed into an intense cyclone with a centre to the south-west of Diamond Island. It advanced with unusual rapidity during the day, and crossed the coast between Akyab and Kyaukpyu at about 2 hrs. of the 16th.	Arakan coast.
2	18th to 20th May ...	In the south-east of the Bay weather was unsettled on the 18th. The disturbed conditions developed on the 19th into a cyclonic storm with its centre in the neighbourhood of Moulmein. It crossed the coast during the next 24 hours, between that station and Tavoy.	Burma coast.
3	27th to 30th May ...	There was a tendency to the formation of a low pressure area in the north-west angle of the Bay on the 26th, and a well defined depression was shown to the west of Akyab on the morning of the 27th. Weather at the head of the Bay was dominated by this depression during the next 48 hours. By the morning of the 30th it had moved inland without further development, and become merged in the low pressure area in Chota Nagpur and the Central Provinces.	Arakan and Bengal coasts.
4	23rd to 26th June ...	A shallow depression formed in the neighbourhood of Gopalpur on the 23rd and remained stationary during the next 48 hours, while decreasing in intensity. It then filled up without moving inland.	Ganjam and Orissa coasts.
5	1st to 3rd July ...	A depression formed to the east of the Sandheads on the 1st. It developed into a cyclonic storm on the 2nd. Its centre at 8 hrs. on the 3rd was close to the Sandheads, and was moving slowly in a direction between west and northwest. The storm, which was then of considerable severity, crossed the coast between Balasore and Chandbali on the afternoon of the same day.	Orissa coast.
6	27th July to 3rd August.	A low pressure area was shown off Ceylon on the 22nd, and drifting slowly northwards became a shallow depression in the latitude of Nellore and Slipper Island on the 27th. The depression continued to move slowly, and lay off the Ganjam and Orissa coasts on the 31st July. On the 1st August it deepened slightly, and by the evening of the 2nd had become a storm of considerable intensity. The centre crossed the coast slightly to the south of False Point about 2 hrs. on the 3rd.	Ganjam and Orissa coasts.
7	7th and 8th August ...	On the 7th a depression formed near the Sandheads. It became slightly intensified during the next 24 hours, moving slowly in a north-westerly direction and was about 30 miles to the south-west of Calcutta at 8 hrs. of the 9th.	Bengal and Orissa coasts.
8	3rd to 8th September	A diffused low pressure area appeared off Akyab on the 3rd, and moving in a westerly direction during the next 24 hours, was in the neighbourhood of the Sandheads on the morning of the 5th. It then moved slowly in a northerly direction and at 8 hrs. on the 8th was shown with its centre close to Calcutta.	Bengal coast.
9	30th September and 1st October.	The depression which had existed in the Bay for some days previously was shown off the Ganjam coast on the morning of the 30th September. It intensified slightly during the next 24 hours, and its centre on the morning of 1st October was in the latitude of Gopalpur. It crossed the coast the same night near False Point.	Ganjam and Orissa coasts.

Number of storm.	Period of depression or storm.	Character of storm.	Coast affected.
10	25th to 27th October	A depression which entered the Andaman Sea from the Gulf of Siam on the 25th October moved in a westerly direction, and crossed the coast near Negapatam on the night of the 27th October.	Coromandel coast.
11	30th October to 1st November.	On the morning of the 30th October a storm appeared to be forming with a centre close to Slipper Island. It moved in a north-westerly direction, and its centre was about 200 miles to the west of Diamond Island at 8 hrs. of the 31st. It then began to fill up, and the residual low pressure area passed over Akyab on the morning of the 2nd November.	Burma coast.
12	3rd to 6th November	A depression formed off Ceylon on the 3rd. It then gradually developed into a small but severe storm which crossed the coast near Nellore on the evening of the 6th.	Coromandel coast.
13	11th to 14th November	Conditions were disturbed in the south of the Bay on the 11th. The disturbance moved in a northerly direction during the next 24 hours. It then curved to the east and developed into a storm of moderate intensity, which crossed the coast near Akyab on the evening of the 14th.	Arakan coast.
14	22nd and 23rd November.	A depression which had existed in the south-east of the Bay for some time previously intensified slightly on the 22nd, but failed to develop into a storm and disappeared on the 24th.	Coromandel coast.

27. The following shows the action taken by the Meteorologist, Calcutta, in the case of each important storm of the foregoing list :—

(1) The storm of the 13th to 16th April was an intense cyclone, the centre of which crossed the Arakan coast on the night of the 15th—16th. The action taken with regard to Akyab, as representing the coast most affected, was as follows :—

12th April, 9·55 hrs.—"Suggest warning signal. Cyclonic storm of unknown intensity formed to West of Andamans near Port Blair; possibly already moving in some northerly direction."

13th April, 10·15 hrs.—"Storm about latitude Table Island developed into dangerous cyclone; motion still uncertain, very likely curve on to Arakan coast."

14th April, 10·46 hrs.—"Storm increased in intensity still about latitude Table Island and longitude 90° moving slowly at present. Direction still uncertain but possibly now towards North-East."

15th April, 10·5 hrs.—"Suggest great danger signal No. 3. Intense cyclone in about lat. 15° and long. 91° moving slowly north or north-east. Recommend every precaution in port."

Warning telegrams were likewise sent at 17·20 hrs. and 21·5 hrs. of 15th.

16th April, 9·35 hrs.—"Suggest lower storm signal; storm now inland."

In addition to the above, storm telegrams were sent to, and signals were hoisted where necessary at Port Blair (5), Diamond Island (5), Chittagong (3), Mergui (5), Tavoy (5), Moulmein (5), Rangoon (5), Bassein (5), Madras (5), Colombo (4), Calcutta and the River Hugli stations.

(2) A cyclonic storm was shown in the neighbourhood of Moulmein on the 19th May The action taken with regard to Moulmein, the port most affected, was as follows :—

19th May, 9·50 hrs.—"Suggest danger signal No. 3. Storm of unknown intensity near Moulmein, direction of motion uncertain; recommend precautions in port."

19th May, 12·30 hrs.—"Telegrams, received late, show that storm was of considerable intensity at eight hrs ; probably approaching and close to Moulmein."

20th May, 10·47 hrs.—"Suggest lower storm signal. Cyclonic storm Andaman Sea passed inland."

In addition to the above, storm telegrams were sent to, and signals were hoisted where necessary at, Diamond Island, Mergui, Rangoon (2) Bassein and Tavoy.

(3) This storm was unimportant.

(4) „ „ „ „

(5) The storm of the 1st to 3rd July was of considerable severity. The centre crossed the Orissa coast on the afternoon of the 3rd, and the action taken with regard to Balasore was as follows:—

2nd July, 9·40 hrs.—"Hoist danger signal No. 2, storm centre to south-east of Sandheads; may give very rough weather shortly head of Bay."

3rd July, 9·10 hrs.—"Centre of storm of some severity will probably pass over or near Balasore in two or three hours."

3rd July, 21·28 hrs.—"Lower storm signal."

4th July, 11·6 hrs.—"Storm now inland in Orissa, weather still very rough head of Bay, but will improve rapidly."

In addition to the above, storm telegrams were sent to, and signals, where necessary, were hoisted at, Rangoon (4), Akyab (3), Chittagong (4), Barisal (4), Morelganj (3), Goalundo (2), False Point (3), Puri (3), Chandballi (4) Calcutta and river stations.

(6) The storm of the 27th July to 3rd August was of considerable intensity. The centre crossed the coast near False Point about 2 A.M. of the 3rd and the action taken with regard to False Point was as follows:—

30th July, 9·57 hrs.—"Hoist warning signal ; storm, at present slight intensity, near Calingapatam moving slowly northerly direction."

31st July, 10·40 hrs.—"Storm probably intensifying, but still not severe; nearly stationary off Gopalpur."

1st August, 10·55 hrs.—"Depression intensifying, but still rather feeble and stationary off Gopalpur. Likely to cross coast south of False Point."

2nd August, 10·12 hrs.—"Lower warning signal; hoist danger signal No. 3; storm now of moderate intensity will probably cross coast near False Point."

3rd August, 10·50 hrs.—"Lower storm signal; storm now inland near False Point; but weather probably still stormy over north Bay."

In addition to the above action was taken at Rangoon (7), Puri (5), Chandballi (5), Balasore (5), Gopalpur (7), Calingapatam (7), Vizagapatam (7), Cocanada (7), Masulipatam (7), Madras (7), Calcutta and river stations.

(7) This storm was unimportant.

(8) „ „ „ „

(9) „ „ „ „

(10) „ „ „ „

(11) „ „ „ „

(12) The storm of the 3rd to 6th November formed off Ceylon on the 3rd, developed into a small, but severe, storm and crossed the coast near Nellore on the evening of the 6th. The following was the action taken with regard to Madras as representing the Coromandel coast:—

6th November, 10·35 hrs.—"Storm approaching coast between Nellore and Madras and quite close, possibly very severe, ports Gopalpur to Madras informed."

7th November, 10·26 hrs.—"Storm now inland ports Gopalpur to Madras informed."

In addition to the above, storm telegrams were sent to Rangoon (2), Gopalpur (2), Calingapatam (2), Vizagapatam (2), Cocanada (2), Masulipatam (2).

(13) The storm of the 11th to 14th November developed moderate intensity, and crossed the Arakan coast on the evening of the 14th. The following was the action taken with regard to Akyab representing the Arakan coast:—

12th November, 10·38 hrs.—"Disturbance unknown, intensity about lat. 16° long. 90°; moving some direction between north and north-west; may curve on to Arakan coast; watch weather, suggest warning signal."

13th November, 11·16 hrs.—"Depression moving towards Gopalpur, but is probably now of little importance; suggest lower warning signal."

14th November, 9·30 hrs.—"Suggest danger signal No. 3; eight o'clock observations show storm quite close to Akyab."

14th November, 15·14 hrs.—"Centre of storm at fourteen hours still moving towards Akyab and very close."

14th November, 20·47 hrs.—"Suggest lower storm signal; storm now inland."

In addition to the above, storm telegrams were sent to Port Plair (2), Rangoon (5), Diamond Island (2), Chittagong (2), Madras (2), Cuddalore (2), Negapatam (2), Pamban (2), Tuticorin (2).

(14) The storm of the 22nd and 23rd November failed to develop, but the following action was taken with regard to Pamban as representing the Coromandel coast:—

21st November, 10 hrs.—"Weather suspicious southwest Bay, some disturbance probably approaching south Madras coast."

21st November, 22·15 hrs.—"Depression now appears to be approaching coast near Pamban. Suggest danger signal number three."

23rd November, 10·50 hrs.—"Depression now probably breaking up, though rough squally weather still reported near Pamban and off Ceylon; suggest lower storm signal."

In addition to the above storm telegrams were sent to Madras (3), Cuddalore (3), Negapatam (3), Tuticorin (3) and Colombo (4).

28. Comparing paragraph 27 with paragraph 26 the results show that for the storms on April 13th to 16th (1), May 18th to 20th (2), July 1st to 3rd (5), and July 27th to August 3rd (6), the warnings issued were in excellent time and the information supplied to the threatened ports was full and useful. On the other hand the amount of warning given in the case of the storm of November 3rd to 6th (12) was slightly brief; in the case of the storm of November 11th to 14th (13) some doubts existed as to the direction of movement of the disturbance and on the 13th it was supposed to be travelling towards Gopalpur and to be of little importance, so that it was suggested to lower the signal; while on the morning of the 14th the danger signal was suggested for Akyab and the storm crossed the Arakan coast on the evening of that day. As will be seen later the Port Officer, Akyab, acting on his own discretion, doubted the movement of the storm towards Gopalpur or its slightness, and disregarding the suggestion to lower the signal kept it flying. In the case of the storm of November 22nd and 23rd (14) an exaggerated view of its importance was taken and the danger signal was suggested at Pamban while as a matter of fact the storm failed to develop and disappeared on 24th.

29. The daily flag signal message was sent to Saugor Island throughout the year and to Elephant Point and Diamond Island from April 1st 1910 to January 14th 1911 only. This message was also sent to the Port Officer, Rangoon, during the period January 15th to March 31st.

Arrangements were made for the exhibition of the flag signals relating to the weather in the four sections of the Bay of Bengal, and of the storm signals on the extended system at Slipper Island. The flag signal message was sent to the Telegraph Master, Slipper Island, from 19th November 1910 to 14th January 1911. In future these messages will be sent from 1st April to 14th January each year.

The Port Officer, Akyab, having expressed a desire to be supplied with the flag signals in addition to the daily weather telegram, arrangements were made for their supply from 30th September 1910.

The following officers were supplied with the flag signals and the daily weather telegram from 1st April 1910 to 14th January 1911 :—

Port Officer, Rangoon.	Deputy Port Conservator, Madras.
Deputy Port Conservator, Rangoon.	Port Officer, Cuddalore.
Port Officer, Akyab.	Port Officer, Negapatam.
Port Officer, Cocanada.	Port Conservator, Porto Novo.

The following officers received the daily weather telegram only during the period mentioned above, *viz.*, from 1st April 1910 to 14th January 1911 :—

Port Officer, Moulmein.

Port Officer, Gopalpur.

Port Officer, Vizagapatam.

Port Conservator, Calingapatam (Sundays, Wednesdays and Thursdays only).

The Port Officer, Chittagong, received the daily weather telegram and the flag signal message from 16th May to 15th November.

30. *Arabian Sea Storm Signal Service.*—The work of warning the Arabian Sea ports was carried out during the past year by the Simla Meteorological Office, which also warned the Madras ports on the Malabar coast. Warnings of storms in the Arabian Sea were also sent to the Port Officer, Aden, for the information of steamers leaving that port. Copies of all warnings sent to the Malabar ports were forwarded for information to the Master Attendant, Colombo; the Meteorological Observatory, Colombo; the Commercial Agent to the Diwan of Alleppi; the Presidency Port Officer, Madras; the Deputy Port Conservator, Madras; and the Chief Engineer for Irrigation, Madras.

Warnings were also sent to the Diwan of Junagadh; the Superintendent of Telegraphs, Gujarat Division; the Agent to the Governor, Rajkot, and through the Commander of the Port, Mormugao, to the Portuguese Port of Diu.

The following is a list of the Arabian Sea and Malabar ports for the warning of which during the year 1910-11 the Simla Meteorological Office was responsible :—

I.—By extended system.	II.—By brief system.	
Karachi.	Cutch-Mandvi.	Murud Janjira.
Bombay.	Jamnagar.	Ratnagiri.
Mormugao.	Dwarka.	Harnai.
Mangalore.	Porbandar.	Mulwan.
Tellicherry.	Veraval.	Goa.
Calicut.	Jafrabad.	Vengurla.
Cochin.	Bhavnagar.	Karwar.
	Daman.	Kumta.
	Alibag.	Honavar.

The approach of the monsoon was notified to the west coast ports as was done in the previous year.

31. The following gives a short statement of the storms which affected the Arabian Sea coasts during the year 1910-11 :—

(1) *June 3rd-4th 1910.*—There were indications of a cyclonic storm forming in the North of the Arabian Sea during the advance of the monsoon in June, and the warning signal was hoisted on the 3rd and 4th June at all ports from Karachi to Bombay, and at Mormugao. The low pressure conditions disappeared without developing into a storm.

(2) *August 20th to 22nd.*—A cyclonic storm from the Bay was crossing the Peninsula, and storm signals were hoisted on the Sind and Bombay coasts. The disturbance disappeared without passing out into the Arabian Sea, and all signals were lowered on the 22nd.

(3) *November 6th and 7th.*—At the beginning of November a depression from the Bay was travelling across the Peninsula, and as it appeared probable that the disturbance would pass out into the Arabian Sea storm signals were hoisted on the 6th and 7th at such ports as were likely to be affected. The depression on approaching the Konkan coast, however, changed its course and filled up over the land.

32. The following shows the action taken by the Simla Office in the case of the disturbances of the foregoing list :—

(1) The indications of a cyclonic storm in the north of the Arabian Sea between the 3rd and 4th led to the following action at Simla to warn Karachi :—

2nd June, 16·30 hrs.—"Monsoon apparently approaching Konkan coast, squally weather likely there."

3rd June, 23·20 hrs.—"Cyclonic storm probably formed about lat. 22° and long. 66°; moving northwards. Hoist warning signal."

4th June, 6·4 hrs.—"Little information yet available; there is certainly area low pressure and squally winds south of Karachi; but doubtful whether fully developed storm, doubtful whether port will experience strong winds, but vessels going out likely meet rough weather."

4th June, 8·10 hrs.—"Northward movement of disturbance apparently checked."

4th June, 11·25 hrs.—"Area of rough weather still to west of Kathiawar: No indication of movement towards Karachi, but caution necessary for vessels leaving port."

4th June, 16·20 hrs.—"Situation unchanged."

4th June, 22·50 hrs.—"Area of stormy weather no longer off Kathiawar coast; has almost certainly dissipated."

5th June, 5·30 hrs.—"Disturbance dissipated; lower signal."

(2) In regard to the cyclonic storm which in August threatened the Bombay and Sind coasts, the following was the action taken at Simla to warn the South Bombay coast :—

21st August, 11·45 hrs.—"Feeble cyclonic storm from Bay now crossing over Peninsula; centre near Bijapur; travelling west-north-west, may give squally weather: Hoist danger signal."

21st August, 21·10 hrs.—"Disturbance probably disappeared, will send definite information tomorrow."

22nd August, 10·40 hrs.—"Disturbance has disappeared: lower danger signal."

(3) For the cyclonic storm which in November threatened the Bombay coast, the following was the action taken at Simla to warn Ratnagiri as representing that coast :—

6th November, 22·45 hrs—"Storm now crossing coast at Nellore likely move westward; not likely give port violent winds, but may affect shipping between lats. 12° and 16°, in 24 hours."

7th November, 12·20 hrs.—"Storm now near Bellary likely cross coast near Goa to-night, and give rough weather from there southwards. Possible, but not probable, that your port will experience stormy weather; hoist warning signal."

7th November, 22·0 hrs.—"Storm now in Bombay Deccan of slight intensity, probably give squally weather on Konkan coast and become more severe when it has passed out to sea. Replace warning by danger signal."

8th November, 11·55 hrs.—"Disturbance now crossing north Konkan coast, but has weakened further and not likely give rough weather but may possibly develop out in Arabian Sea: Lower signal."

33. The two preceding paragraphs exhibit the difficulties which attend the work of warning the ports on the west coast of India. In the case of cyclonic storms forming over the Arabian Sea the only observations available for forming

a judgment are those from one limb only of the disturbed area, *viz.*, the coasts of Sind, Bombay and Malabar; and the difficulty of determining the distance and intensity of the supposed disturbance is obvious, while, in the case of storms traversing the Peninsula and threatening to redevelop in the Arabian Sea, it is at present almost impossible to say whether the attendant cyclonic circulation will break up during the passage of the Western Ghâts, or whether the storm will surmount this obstacle and pass out into the Sea area.

34. As regards the storm warning services generally, the Port Officers at the principal ports on both sides of India state that the system worked satisfactorily in every respect during the year and they suggest no change. The following extracts from some of their reports are interesting as exemplifying the success of the departmental warnings, in some regions, and the difficulties experienced in others.

The Principal Port Officer, Burma, Rangoon, in connection with the cyclone which passed over Akyab on the night of the 14th April 1910 (storm No. 1 of Bengal List), reports "that the Port Officer, Akyab, in his report to me of the damage caused by the cyclone states that the damage to the shipping in port would have been of a much more serious nature had not the Meteorological Department kept me so well informed of the approach of the cyclone, enabling me to tow all boats into a safe anchorage, and to issue notices to the merchants and vessels in the port to take all precautions necessary".

The Principal Port Officer adds "I feel sure you will be gratified to learn how much your storm warnings are appreciated, and with regard to Rangoon I can assure you that the progress of the storm and its intensity were indicated with great accuracy, and owing to this the damage done to small craft was inconsiderable".

The officer in charge of the service at Ratnagiri reports that out of the 116 telegrams received during the year at Ratnagiri, all were timely and satisfactory, except in the case of the "violent storm" on the Ratnagiri coast on the 30th September, the telegraphic intimation of which was received on the 1st of October.*

On the 13th November (storm No. 13 of Bengal List) a telegram was issued to the Port Officer, Akyab, among other officers, suggesting to him to lower the warning signal. In his report on the weather that officer said of this message "most misleading as weather here showed close proximity of cyclone; kept signal flying". On further enquiries being instituted the successor to the Port Officer wrote "these remarks were made by my predecessor and I can find nothing on record to justify them". See, however, the statement about these warnings in paragraph 28.

Flood warnings and weather forecasts to District, Irrigation, Railway and other Officers.

35. This work is carried out chiefly by the Simla Meteorological Office, but partly by that of Calcutta. The arrangements for it have been sanctioned at various times, and differ considerably in character, according to the nature and extent of the flood or weather warnings required by the officers concerned. In some cases these officers require telegrams warning them of advancing storms likely to give heavy rain, or of actual heavy rainfall, likely to give rise to severe floods which might injure railways or canal works; and in others they require warnings or forecasts of the weather for as long a period beforehand as possible, so as to enable them to modify their arrangements for carrying on the works under their charge so far as may be necessitated by sudden or large changes of weather.

The number of district officers and officers in the irrigation, railway and other departments requiring warnings from Simla amounted at the end of the year to 96, an increase of 1 during the year.

This number does not include captains of mail steamers and other vessels who occasionally telegraph from Karachi, Aden and other ports for the latest intelligence respecting the position and movement of cyclonic storms, nor does it include the names of other individuals or firms who ask for special forecasts.

The number of special warning messages sent from Simla during the year 1910-11 was 2,649, as compared with 941 in 1909-10 and 1,199 in the year before.

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* An area of low pressure lay to the north of Ratnagiri on the 30th September, and was causing winds of force 6 or 7 in the vicinity of that part, but the available marine information shows that there was no storm at sea. A message was sent to Ratnagiri at 22·20 hrs. on September 30th as follows :—"Depression over south Gujarat giving strong winds off Bombay coast."

Warnings of floods or of heavy rainfall were issued by the Meteorologist, Calcutta, to officers of the Public Works, Telegraphs and other Departments, chiefly in Bengal and on the East Coast.

Instructions were issued nine years ago by the Government of India that every officer to whom storm or flood warnings are issued, should in the month of January of each year or in the case of military expeditions at the close of the campaign, forward to the head of this department a brief return of the warnings received during the past year and should also report:—

(1) Whether the warning telegrams were rapidly transmitted and delivered by the Telegraph Department.

(2) Whether the warnings were timely and satisfactory in every respect, and, if not, in what points they were defective.

(3) Whether any changes might be made in the system which would make the warnings more useful.

Reports on the storm and flood warnings for the calendar year 1910 were received from 59 officers. Of these 50 reported that the warnings were timely and satisfactory and were rapidly transmitted by the Telegraph Department; 4 offered no remarks and 5 officers, of whom, however, only one was on the warning list, reported that they had received no warnings during the year.

A comparison of the reports of floods and of heavy rain with the information supplied to the various officers would appear to show that the system is working satisfactorily, and that most of the warnings issued were timely and of use to the recipients. No suggestions were put forward by the officers concerned for changes or improvements in the flood warning service.

Seasonal Forecasts.

36. The forecast for the monsoon period of 1910, dated the 9th June, was sent to Local Governments and Administrations, communicated to the press and printed in the Gazette. A statement of the rainfall of June and July with a forecast for August and September was drawn up on the 6th August and published in a similar manner.

A statement of the actual rainfall during the monsoon period and a comparison of the two forecasts with actual rainfall was drawn up on the 23rd December 1910 and sent to Local Governments and Administrations.

The following shows the points of these two forecasts, and gives a comparison of them with the actual rainfall:—

Forecast.	Remarks.
(1) There appears to be no cause for expecting a large excess or defect in the total amount of monsoon rainfall.	Verified. The excess of the total monsoon rainfall, averaged over India, was 1·7 inches, or 5 per cent.
(2) The rains are likely to be less steady than usual, especially those due to the Arabian Sea current, and periods of marked weakness are likely to alternate with bursts of abundant rainfall.	Verified.
(3) Rainfall due to the Bay current is likely to be on the whole more plentiful, by comparison with the normal, than that due to the Arabian Sea current.	Incorrect: the Arabian Sea current was appreciably more active than the Bay current.

MEMORANDUM OF THE 6TH AUGUST 1910.

Forecast.	Remarks.
(*a*) The general outlook appears more uncertain than usual, but there is no reason for expecting a large defect in the total amount of rainfall during August and September.	The total rainfall during August and September was in excess by 2½ inches.
(*b*) The unsteadiness in the monsoon, especially in that of the Arabian Sea, is likely to persist, and there will probably be marked breaks as well as periods of plentiful rainfall.	Verified.
(*c*) The quantity of snow on the hills is not sufficient to exert any prejudicial influence upon the rainfall of northwest India.	Verified. The rainfall of northwest India during August and September was in decided excess.
(*d*) The weakness of the Bay current is likely to continue, and there is no cause for anticipating an early large improvement in the rainfall of the Gangetic plain.	Only partially verified. The Bay current continued weak except in Burma: but a considerable improvement occurred in the Gangetic plain about the middle of August, owing chiefly to an unusual northerly extension of the Arabian Sea current.

A memorandum on the weather during November and December 1910, with a forecast of that of January and February 1911, was prepared on the 2nd January and issued in the same manner as the forecast of the previous June. On the 12th July 1911 a comparison of the actual precipitation with the above forecast was issued: the forecast and actual conditions are shown in the following statement :—

Forecast.	Remarks.
The indications are somewhat conflicting, but it appears likely that the rainfall in the plains of northwest India will be in moderate defect or normal, and that the precipitation in the surrounding mountain districts will be normal or in moderate excess.	The evidence now available is not in agreement with the former of these anticipations, and in regard to the latter, actual snowfall proved to be in somewhat greater excess than was indicated.

DAILY TELEGRAPHIC WEATHER SUMMARY.

37. The summary was despatched daily at about noon.

It was exhibited at certain telegraph offices, and sent to 86 officers of Government. The number of subscribers was as follows :—

Subscribers.	Number during monsoon period of 1910.	Number on 31st March 1911.
Newspapers	7	8
Private individuals	32	4

PUBLICATIONS.

A.—WEATHER REPORTS.

38. *India Weather Reports.*—The following weather reports, giving information of the current weather to the Government and the public, were published during the year by the Simla Meteorological Office :—

(1) India Daily Weather Report.

(2) India Weekly Weather Report, giving an account of the weather and of the rainfall of the week ending on the previous Thursday, published in the *Gazette of India* every Saturday.

(3) Monthly Supplement to the India Daily Weather Report, published in the first week of the succeeding month.

(4) Annual Supplement to the Daily Weather Report.

(5) India Monthly Weather Review, giving a general summary of all the important features of the weather, and complete meteorological data of the month ; the data for this are not at once available and it is usually published three months after date.

(6) Annual Summary of the Monthly Weather Reviews.

For a detailed description of the contents of these publications reference may be made to the Departmental Administration Report for 1907-08.

India Daily Weather Report.—The number of stations for which data were given in the daily report of the 31st of March 1911 was 178. The following table shows the distribution of the reports :—

	Number of recipients on the 31st March.				
	1911.	1910.	1909.	1907.	1905.
Government Officers ...	516	514	509	442	408
Foreign recipients ...	47	45	46	46	46
Newspapers ...	2	2	2	2	2
Subscribers	19	17	18	11	12
Total ...	584	578	575	501	468

39. *Annual Summary.*—The annual summary of the meteorology of India for 1909 supplementing the Monthly Weather Reviews for that year, was issued in December 1910. It contains mean data for the year, and a discussion of its more important meteorological features together with their mutual relations. A summary of the meteorology of the year 1909 was also prepared for the Sanitary Commissioner with the Government of India, and was given as Chapter I of the Annual Report of that officer for the year.

40. *Special Charts.*—The Simla Office prepared, throughout the year, weekly charts showing the character of the rainfall of each week and of the seasonal rainfall up to date, for the use of His Excellency the Viceroy, His Majesty's Under Secretary of State for India, London, the Hon'ble the Finance Member and the Secretary to the Government of India in the Revenue and Agricultural Department.

41. *Provincial Weather Reports.*—The following provincial reports were issued by the local meteorologists during the year :—

(1) Calcutta—

(*a*) Daily Weather Repor t.

(*b*) The supplementary weekly meteorological and rainfall table containing temperature and rainfall observations recorded at 19 stations in Bengal and in Eastern Bengal and Assam, issued to all subscribers of the Weather Report on every Wednesday throughout the year.

(2) Bombay—

(*a*) Daily Weather Report.

(*b*) Monthly abstracts of meteorological observations published in the Bombay Government *Gazette*.

(3) Madras—

(*a*) Daily Weather Report.

(*b*) Monthly Rainfall Tables for Madras, Coorg, Pudukkottai, Cochin and Travancore, published in the Provincial *Gazette*.

(4) Allahabad—

(*a*) Monthly Weather Summary of the United Provinces published in the Provincial *Gazette*.

(*b*) Brief sketch of the meteorology of the United Provinces for the year 1909.

(*c*) Monthly Rainfall Tables for the United Provinces published in the Provincial *Gazette*.

(5) Simla—

(*a*) Monthly Summary of the weather of the Punjab, published in the Provincial *Gazette*.

(*b*) Annual Meteorological Summary of the Punjab for the year 1909-10.

42. *Memoirs of the Indian Meteorological Department.*—The following were published during the year 1910-11 :—

(1) On the electricity of rain and its origin in thunderstorms by George C. Simpson, D.Sc., Imperial Meteorologist. (Memoirs of the Indian Meteorological Department, Volume XX, Part VIII.)

(2) Correlation in seasonal variations of weather, II, by Gilbert T. Walker, M.A., Sc. D., F.R.S., Director General of Observatories. (Memoirs of the Indian Meteorological Department, Volume XXI, Part II.)

Supply of meteorological information.

43. In addition to the meteorological information published by the department the following special information was supplied to other meteorological institutions:—

(*a*) Weekly telegrams containing weekly pressure departures from normal of Bombay, Seychelles, Zanzibar and Aden were sent to the Director General, Survey Department, Cairo, during the monsoon period.

(*b*) Monthly telegrams were sent to the Meteorological Office, London, during the monsoon period giving information of the state of the Arabian Sea and Bay of Bengal for insertion in their monthly pilot charts.

(*c*) Monthly telegrams were sent to the Solar Physics Committee, London, throughout the year giving the mean monthly pressure of Bombay.

(*d*) Monthly telegrams were sent to the Meteorological Department, Melbourne, Australia, throughout the year giving the monthly mean pressure and temperature departures from normal of India, and a short description of the general conditions of weather.

(*e*) Weekly code telegrams were sent during the monsoon period from Simla to the Calcutta Meteorological Office for drawing up a table of rainfall, humidity and temperature at 100 representative stations in India, to be published by the Director General of Commercial Intelligence in the *Indian Trade Journal*.

Climatological information, at times involving special calculation, is also provided for sanitary and other officers of Government, as well as for private firms who are willing to pay the expense necessarily incurred. The extent to which the Department is utilised in this manner is increasing steadily.

Miscellaneous.

44. Nine hundred and fifteen books and pamphlets, either purchased or presented by scientific bodies, were added to the Library during the year. The Library is on the whole in fair order.

Nineteen libraries, observatories or societies were added during the year to the list of institutions to which the publications of the India Meteorological Department are supplied, and five were removed; the number on the list is now 398.

Chief Features of the Year.

45. The work of the department falls naturally into two parts, (1) the directly useful and (2) the scientific, which aims at ascertaining facts which shall be of practical usefulness in the near future. The former part consists chiefly of the collection and distribution of current weather information, the supply of climatological data, the issue of storm and flood warnings and the provision of time signals. The scientific work includes the experimental and theoretical examination of the physical processes, on the earth or the sun, which determine the weather.

The number of storms over the Indian seas was not exceptional during the year under review, and in the Arabian Sea no storm of importance was recorded. Information regarding the storms, the success of the warnings issued and remarks on the usefulness of the storm signal service have been given in paragraphs 25 to 34. In the Bay of Bengal the most important storm was that which crossed the coast near Akyab on the morning of April 16th. Although most of the storms were of only slight or moderate intensity, the work of issuing warnings was as usual heavy and difficult.

The work of issuing predictions of heavy rain to officers requiring them, or information of unusual precipitation which has actually occurred, has been placed on a satisfactory basis, and has in general been carried out with as much success as can reasonably be expected. Owing to the general heaviness of the monsoon the number of special warning messages sent from Simla increased largely, the numbers being 1,199 in 1908-09, 941 in 1909-10 and 2,649 in 1910-11.

A conspicuous feature of the work of the department has been the continuous growth of the departmental correspondence. Requests for information, in general of a statistical character, have come in numbers from officers interested in the relations of weather and disease, of weather and agriculture, etc., as well as from firms wishing to start factories under special conditions; while enquiries about meteorological subjects—books, instruments and methods of observation—have been very numerous. The amount of work involved has been very considerable.

On the scientific side work has been much hampered by the weakness of the gazetted staff. Dr. Simpson has been absent with the South Polar Expedition throughout the whole year and his experiments in the electrification of the atmosphere, his observations with the Benndorf self-registering electrometer naturally came to an end, as Mr. W. A. Harwood who was appointed to act for Dr. Simpson from the 15th of April was wholly new to the work of the Department and had to spend his time on routine duties.

In addition, Mr. J. Patterson, who was appointed to the Department in 1905, resigned his post on the 6th of May, and the vacancy caused by this resignation was not filled up. On the other hand some progress has continued to be made in the examination of the conditions in the upper air, and India is following in the wake, though very far in the wake, of other civilised countries in conducting observations with balloons to sound the depth and hygrometric character of the monsoon and other air currents on which the Indian weather depends.

At Kodaikanal Mr. Evershed has continued his spectroscopic, photographic and instrumental examination of the sun and its atmosphere. The staff at Kodaikanal has been changed by the retirement of the Director, Mr. Michie-Smith, and the appointment on the 28th of February of Mr. T. Royds as Assistant Director.

The memoirs of the Department have been added to by two valuable papers, *viz.*, that "On the electricity of rain and its origin in thunderstorms" by Dr. Simpson and by a paper on "Correlation in seasonal variations of weather", part II, by Dr. Walker, the latter being an important contribution towards the question of forecasting future weather conditions.

Concluding remarks.

46. The Meteorological Department owes a large part of its usefulness, its activities, and its progress to the sympathetic assistance it receives from outside departments. Civil Surgeons and other officers of the Medical Department, as unpaid superintendents of observatories and in other capacities, help in the daily record of meteorological work; the Telegraph and Postal departments assist in every way in the rapid transmission of meteorological information, at the same time that they allow their employees to act as observers. The Eastern Telegraph Department, by transmitting the daily Aden message free, and the Indo-European Telegraph Company by giving free transit to the daily records of the Persian observatories, place a large volume of most valuable information at the disposal of the Meteorological Department.

Weekly telegrams were received from the 1st May to the 15th October from the Director of the Royal Alfred Observatory, Mauritius, as well as from the departmental observatories at Zanzibar and Seychelles. These telegrams gave valuable information of the weather conditions in the Indian Ocean and the Department is indebted to the officers indicated for the punctual transmission of the information. Thanks are more specially due to the Director of the Royal Alfred Observatory for his courtesy in placing the meteorological data of that observatory at the disposal of the India Meteorological Department.

The Department is greatly indebted for important information as to meteorological conditions prevailing antecedent to and during the south-west monsoon, to the Director of the Government Observatory, Durban; the Director, Agriculture and Forestry Department, Zomba, British Central Africa; the Meteorologist, Dar-es-Salaam; His Majesty's Commissioner, Entebbe, Uganda; the Director General, Survey Department, Cairo; the Commonwealth Meteorologist, Melbourne; the Directors of the Observatories at Buenos Ayres and Santiago; and to the various officers around the Indian frontiers who have collected and supplied valuable snowfall information.

The Central office of the Meteorological Department, at Simla, was under the charge of Dr. Walker throughout the year under review and the general administration of the Department was in his hands while the local officers who have helped very materially with the current work of the Department were as follows:—Calcutta, Mr. C. W. Peake; Madras, Mr. R. Ll. Jones; Bombay, Mr. H. A. Armstrong; and Allahabad, Dr. E. G. Hill and Mr. J. J. Durrack.

J. H. FIELD,

Offg. *Director General of Observatories.*

Simla, the 28th October 1911.

G. C. B. P., Simla.—No. 268 M. R. G. I.—18-11-11.—280—D. D.

REPORT

ON

THE ADMINISTRATION

OF

THE METEOROLOGICAL DEPARTMENT

OF

THE GOVERNMENT OF INDIA

IN

1912-13.

CHANGES IN THE STAFF DURING THE YEAR.

Dr. Gilbert T. Walker resumed charge of the office of Director-General on the 21st April 1912 on the termination of combined leave to Europe.

Mr. J. H. Field proceeded on privilege leave for three months from 31st August 1912 to 30th November 1912 combined with furlough for one year and nine months from 1st December 1912.

Dr. George C. Simpson returned from the British Antarctic Expedition on 24th August 1912.

Mr. W. A. Harwood was on three months' privilege leave from 15th January 1913 to 14th April 1913.

Mr. C. W. Peake was on special duty at Dacca from 17th July 1912 to 19th August 1912, and on privilege leave from 27th September 1912 to 28th October 1912. Dr. E. P. Harrison acted.

Mr. H. A. Armstrong proceeded on three months' privilege leave combined with 18 months' furlough from 5th February 1913. Mr. G. W. Talbot acted.

Dr. E. G. Hill was on leave during the College vacation from 25th April 1912 to 20th July 1912. Dr. A. P. Sircar acted.

OBSERVATORIES.

2. The observatories maintained by the Government of India are classified as follows :—

First Class.—Observatories which are furnished with autographic instruments for continuously recording pressure, temperature, humidity, and wind direction and velocity, in addition to instruments read by eye.

Second Class.—Observatories at which readings are taken daily at 8 hrs., 10 hrs., and 16 hrs. : those at 8 hrs. are (with a few exceptions) transmitted by telegram to one or more of the offices at Simla, Calcutta, Bombay and Madras for inclusion in the India or Provincial Daily Weather Reports.

Third Class.—Observatories—

(*a*) where readings are taken daily at 8 hrs. only; at those stations where there are telegraph offices the observations are transmitted by telegram for inclusion in the Simla, Calcutta, Bombay or Madras Daily Weather Reports;

(*b*) at stations where there are no telegraph offices, and observations are recorded at 10 hrs. and 16 hrs. only; these are included in the Monthly Weather Reviews, and furnish a series of observations for the determination of monthly and daily means which should be comparable with the means already obtained for second class observatories.

Fourth Class.—Observatories at which observations of temperature, wind and rainfall only, or of temperature and rainfall only, are recorded.

Fifth Class.—Observatories which telegraph rainfall only.

3. At the end of the year the total number of observatories was 283, of which 48 were non-departmental and 235 were maintained by the Government of India. Of the 235 departmental observatories, 7 were first class, 4 second class, 181 third class, 23 fourth class and 20 fifth class.

4. The changes in non-departmental observatories during the year were the following:—

(1) A fourth class observatory was opened at Lumding on 1st April 1912 under the superintendence of the Medical Officer, Assam Bengal Railway, and a fifth class observatory was opened at Khanpur on 25th February 1913.

(2) The following observatories were closed:—

(*a*) The third class observatory at Chitral on 1st August 1912.

(*b*) The fourth class observatory at Ballia on 1st January 1913.

(3) The third class observatory at Drosh was changed from non-departmental to departmental on 6th August 1912.

(4) The third class observatory at Cooch Behar was changed to fifth class on 1st April 1912.

The following were the changes in departmental observatories during the year:—

(1) Third class observatories were opened at Fort Sandeman on 1st April 1912 and at Hukitala on 18th September 1912.

(2) A fifth class observatory was opened at Asansol on 1st February 1913.

(3) The observatory at Simla was reduced from second to third class on 1st January 1913.

(4) The following observatories were reduced from third to fifth class on 1st April 1912:—Arrah, Bankura, Bhagalpur, Chapra, Comilla, Dehri, Faridpur, Hazaribagh, Krishnagar, Malda, Motihari, Muzaffarpur, Rampur Boalia, Rangpur, Raniganj, Sirajganj and Tinnevelly.

(5) The third class observatory at False Point and the fifth class observatory at Raniganj were closed on 18th September 1912 and 1st February 1913 respectively.

First Class Observatories.

5. The Directors of the Observatories of Kodaikanal, Madras and Bombay publish separate annual reports which are forwarded for the information of Government. It has accordingly been ruled as unnecessary to include information relating to the working of these observatories in this Administration Report.

6. At Alipore (Calcutta), Allahabad and Lahore the following special instruments were in use during the year :—

Alipore.	Allahabad.	Lahore.
Bergholz barograph.	Beckley anemograph.	Draper barograph.
Kew barograph.	Richard barograph.	Richard barograph.
Kew thermograph.	Richard thermograph.	Casella rain-gauge.
Richard thermograph.	Stokes sunshine recorder.	Beckley anemograph.
Beckley anemograph.	Solar radiation thermometers.	Sunshine recorder.
Dines' pressure tube anemometer.	Grass thermometer.	Grass thermometer.
Beckley rain-gauge.	Ground thermometer.	Nephoscope.
Monthly rain-gauge.	Nephoscope.	
Hellman Fuess rain-gauge.		
Milne seismograph.		
Grass thermometer.		
Ground thermometer.		
Nephoscope.		

7. *The Alipore Observatory.*—This observatory is under the charge of the Meteorologist, Calcutta.

The autographic instruments have on the whole worked satisfactorily during the past year.

All instruments issued by the Meteorological Department are tested at this observatory and their corrections ascertained before they are sent out for use. The number of instruments tested and verified during the year was 1,207 as compared with 771 last year. 206 instruments were condemned as unfit for issue, or were sent to the India Office for repair and 11 instruments were kept in store for future treatment. In addition to the above, 227 instruments were examined and issued to other observatories.

The observatory gives mean Calcutta time to the port and shipping. Three time balls are dropped daily at 1 P.M. local mean time throughout the year, one on the Semaphore Tower at Fort William, the second at the Port Commissioners' office and the third at the Kidderpore Docks.

This work was carried out quite satisfactorily as far as this department is concerned. There were 50 failures as compared with 15, the average number of the past 24 years ; but in all cases they were due to defects in the electric or mechanical arrangements outside the observatory, for which this department is not responsible.

Year.	Number of days on which one or other ball failed to drop properly.	Number of failures due to telegraphic defects.
1912-1913	50	50
1911-1912	21	21
1910-1911	21	20
1909-1910	28	27
1908-1909	18	18

8. *The Allahabad Observatory.*—This observatory is under the charge of the Meteorologist, Allahabad.

Beckley anemograph.—This instrument did not work so well during the past year; there were short breaks on twenty occasions caused either by the instrument being out of order or the clock stopping.

Richard barograph.—This instrument gave excellent tracings throughout the year. All the charts have been tabulated.

Richard thermograph.—The wet bulb tracings of the thermograph have again not been very good, but the dry bulb tracings, with a few exceptions, have been satisfactory.

Sunshine recorder.—This gave good results without a break.

Nephoscope.—Regular observations have been made with the Duboscq instrument.

Readings of all the eye instruments were taken every two hours from 6 hrs. to 22 hrs. The earth thermometer on the surface was read at 6, 14 and 22 hours up to 5th December 1912 and only at 14 hours thereafter.

9. *The Lahore Observatory.*—Eye observations of the ordinary meteorological instruments were taken seven times daily at this observatory as in past years at 6, 8, 10, 14, 16, 18 and 22 hrs. Ground surface temperature was recorded four times daily at 6, 10, 16 and 22 hrs.

Character of the work of Observation at second and third class observatories.

10. The general character of the work of the observatories, as judged by the number of mistakes made by observers was satisfactory.

The number of stations of great reliability, in which either no mistake or only one mistake has been detected in the data for the Indian Daily Weather Report, was 45 as against 32 in 1911-12; while, the number of stations at which more than 50 mistakes were made was 18 as against 14 last year.

The usual list showing the number of mistakes in observation and in the preparation of telegrams for all the observatories which send weather telegrams to the Simla office was prepared and circulated to the observatories on the 21st June 1913.

Inspection of Observatories.

11. The number of visits paid to observatories during the year under review was 51 as compared with 37 in the previous year and an average of 64 during the past 10 years.

The Director-General inspected the observatories at Calcutta, Bombay, Alibag, Madras, Kodaikanal and 5 third class observatories in Burma; Mr. Hem Raj inspected 11; Mr. Bion 7; Mr. Gaetane 17; Mr. Subrahmanyam 6; Mr. C. Chengalvaraya Mudeliar 4; and the Chief Observer, Allahabad 1.

Of the 51 observatories that were visited 31 were reported as good, 17 as tolerable and 3 as bad.

Condition.	Number of Observatories Inspected in					
	1912-13.	1911-12.	1910-11.	1909-10.	1908-09.	1907-08.
Good or satisfactory ...	31	20	23	25	40	43
Tolerable	17	16	31	11	20	18
Bad	3	1	3	4	2	10
Total ...	51	37	57	40	62	71

In estimating the general character of the observatories from the above table it must be remembered that it is, as a rule, on account of something unsatisfactory that a visit of inspection is made. The general level of the stations is thus decidedly better than might otherwise appear. The most frequent cause of bad work is the changing of observers at short intervals necessitated by acting and other arrangements in the Medical, Telegraphic and Postal Departments.

Special Observations.

12. Observations other than those recorded by local observers at regular intervals are made as follows:—

(*a*) In accordance with orders issued from the Simla or Calcutta office, when weather is disturbed and storm warnings may have to be issued: such observations are sent by telegraph. Certain observers at coast observatories are in receipt of a regular monthly allowance of Rs. 5 for sending special storm warning telegrams, while other observers receive an allowance of Re. 1 for each set of special observations sent under instructions from either Simla or Calcutta. The number of telegrams of the latter class forwarded during the year under review was 607, as compared with 796 despatched the previous year.

(*b*) Certain observers, when they consider that conditions at sea are sufficiently threatening, send of their own initiative to Simla or Calcutta a telegram containing special observations. No occasion of this type occurred.

(*c*) In connection with flood warning a number of observers have been instructed to send telegrams announcing the occurrence of heavy rainfall to Government officers and railway engineers who desire early information. The number of telegrams so sent was 159 as compared with 135 last year.

(*d*) Observers are instructed to send detailed information of earthquakes to the Simla Meteorological office and to the Director, Geological Survey, Calcutta: for this work they are paid awards from this department. 182 reports were received during the year.

Observations with special Meteorological Instruments.

13. The following special observations were carried out during the past year at certain selected stations:—

1st.—Wind observations recorded by Beckley anemographs at 11 stations, and by Dines' pressure tube anemometers at 4 stations.

2nd.—Solar and terrestrial radiation observations at 3 and 11 stations, respectively.

3rd.—Underground temperature observations at 2 stations.

4th.—Sunshine observations at 7 stations.

5th.—Barometric observations recorded by self-registering instruments, chiefly Richard barographs, at 18 stations.

6th.—Temperature observations recorded by self-registering instruments, chiefly Richard thermographs, at 11 stations.

Observations of solar energy in absolute units.

14. Observations were continued at Simla throughout the year, when weather conditions allowed, by means of Angstrom's electric pyrheliometer.

Observations in the upper air.

15. At the instance of the Royal Society, this branch of scientific research has received a fresh impulse, and the hope is now entertained that more will be accomplished in this direction in the near future than has been possible in the past. Sanction has been given for a scheme under which Mr. J. H. Field, (with the assistance of Mr. W. A. Harwood) will embark on a series of investigations which is calculated to extend over a period of ten years. The headquarters of the

work will be at Agra, where it is proposed to send balloons fitted with recording apparatus about twice weekly to as great a height as can be reached; and there will probably be four or five sub-stations from which, as well as from Agra, balloons carrying apparatus will be sent up several times a week to more moderate heights, say to about 12,000 feet. Pending the construction of the necessary buildings at Agra, activity in upper air research must necessarily be restricted to the reduction and discussion of data previously collected and to work with pilot balloons.

Researches by the Simla Staff.

16. Owing to Mr. J. H. Field's absence in England and the consequent pressure of administration, no systematic research work has been possible. Perhaps the most important memoir published was that giving information regarding the extent to which different parts of India are liable to heavy rain.

Seismograph Observations.

17. Seismological observations were recorded by two Omori-Ewing seismographs at Simla and one at Bombay; by Milne seismographs at Alipore (Calcutta), Kodaikanal and Colaba (Bombay); and by means of other self-registering instruments at the last named station. All the instruments worked satisfactorily throughout the year, and copies of the records of the Milne's seismographs were transmitted to the Seismological Committee of the British Association.

Marine Meteorology.

18. No change was made during the year under review in the method of collecting marine information.

At Calcutta and Bombay a clerk at each port spends his whole time in visiting ships, making in each case a copy of the log and a comparison of the ship's barometer with a secondary standard, for the purpose of applying the necessary corrections to the readings in the logs; and, after the barometer comparisons have been made a statement of the error of the ship's barometer is given to the captain, in case he should desire to make use of it. The number of ships visited is materially less than that of the vessels which come into port, but it is ample for the purposes of the department.

The data thus obtained are utilised in the preparation of charts of disturbances in the Bay of Bengal and the Arabian Sea for future reference in connection with the storm warning work of the department, and in drawing up an account of the storms of the year for publication in the Annual Summary.

The arrangements made with the London Meteorological Office, the Royal Alfred Observatory at Mauritius, and the Deutsche Seewarte, Hamburg, for collecting marine data from the whole of the Indian Ocean, have been continued and the thanks of this department are again due to these three offices for thus supplying a large amount of useful data.

Observations recorded during the year at the entrance of the River Hughli were supplied to the Meteorological Department by the light-vessels "Comet" and "Luna."

Snowfall Registration in the Mountain Districts to the North and West of India.

19. The information as to the amount, distribution and time of occurrence of the snowfall in the Himalayan and Afghan mountain areas was on the whole tolerably complete, and the thanks of the department are again due to the various officers who have collected and forwarded it. Additions to the information received have been obtained by continuing the series of large-scale photographs of the snows, as seen from Simla, which was started in 1905.

Rainfall Registration.

20. The registration of rainfall in India has invariably been carried out by the provincial authorities. In 1889 a uniform system was introduced by the Government of India, and the Director-General of Observatories was made consulting officer in connection with this work. His advice is sought regarding the starting of new rain-gauge stations, and he receives annual reports from the local officers responsible for the registration of rainfall upon

the efficiency of the work. A general account of the system, which came into operation in the year 1891-92, will be found on pages 5-8 of the Administration Report of the year 1889-90, and on pages 6 and 7 of the Administration Report for the year 1890-91.

The following is a statement of the number of rain-gauge stations from which data were being received for publication in the Rainfall Data of India at the end of the year under review :—

Province or Division.	Number of rain gauges supplying returns for publication on 31st March 1913.	Province or Division.	Number of rain gauges supplying returns for publication on 31st March 1913.
Burma	200	Baluchistan	90
Assam	124	Rajputana	185
Bengal	225	Bombay and Sind	289
Bihar and Orissa	258	Central India	117
United Provinces	276	Central Provinces	174
Punjab...	188	Hyderabad	22
Kashmir	37	Mysore	77
North-West Frontier Province ...	33	Madras (including Pudukkottai, Coorg, Travancore and Cochin).	501

The following paragraphs give a brief summary of the reports of the officers in charge of rainfall registration for the year 1912-13 :—

Assam.—The system of registration remained the same as in the preceding year. The total number of rainfall stations was 124, or one more than last year. The number of gauges inspected was 62 as compared with 72 inspected during 1911-12. The gauges in Cachar and the Khasi and Jaintia Hills were not inspected at all. Ten stations were inspected more than once.

Baluchistan.—No report has been received.

Bihar and Orissa.—There are 257 rainfall stations in this Province: only 34 inspection reports in the prescribed form were received in the course of the year ending 31st March 1913, but the Local Government is addressing Districts Officers on the subject of submitting more regular reports of inspections in future.

Bengal.—The number of stations on 31st March 1913 was the same as last year, namely 225; and of these 60 were inspected as compared with 108 inspected last year.

Berar.—The number of rain-gauges maintained during the year was the same as last year (44), and the number of inspections was 142 against 150 in the previous year. Only two rain-gauges were not inspected.

Bombay and Sind.—One new station was added last year making a total of 276 out of which 209 stations were inspected as compared with 190 last year. 78 gauges were inspected more than once and the total number of inspections amounted to 299 as against 288 inspected last year. Sufficient attention seems not to have been paid to this work in 4 districts in the Deccan, 1 in the Karnatak, 2 in the Konkan and 3 in Sind, and the attention of the collectors concerned is being invited to this point.

The improvement noticed last year in Native States was not quite maintained during the year under review. 41 gauges as against 44 were inspected out of a total of 61. 4 gauges were inspected more than once and the total number of inspections amounted to 47.

Burma.—The total number of rain recording stations in the Province is 200 as against 198 at the close of last year. Of these 19 are meteorological observatories and 26 are under the Public Works Department. The number of raingauges inspected was 154, or 21 more than last year, and of these 111 are reported in good condition, 43 being in a fair state.

Central Provinces.—The number of raingauges maintained during the year was 111 against 109 in the previous year. The number of inspections of which reports were received was 133 against 104 in the preceding year. The raingauges at 4 stations were not inspected. The results during the year were on the whole satisfactory.

Central India.—No report has been received.

Hyderabad.—In addition to two raingauges maintained by the Resident, there are 17 rainfall stations maintained by the Public Works Department which are all reported as efficient. There are also three raingauge stations maintained by the railway and revenue authorities.

Kashmir.—Out of the 36 rain-recording stations in the state, 8 are meteorological observatories and the remainder are in charge of the Revenue Department. Only 10 stations were inspected during the year. The attention of the local officials is being drawn to the necessity for having the raingauges inspected at least once in the year.

Madras.—On the 31st March 1913 there were 474 rain-recording stations (excluding the meteorological observatories) or one more than last year. Of these 390 are in the Madras Presidency and 380 were inspected as compared with 381 inspected last year.

Mysore.—At the close of the calendar year 1912 there were 220 raingauge stations as against 219 in the previous year. Out of these 188 or 85 per cent were inspected as compared with a percentage of 88 last year. The gauges were, on the whole, maintained in a satisfactory condition.

North-West Frontier Province.—The report on rainfall registration contained in the current administration report of the North-West Frontier Province refers to the year 1911-1912 and states that the raingauges and rainfall registers were in good order and properly maintained. There was no change in the numbers or situation of the raingauges.

Punjab.—The total number of raingauges in the Punjab during the calendar year ending December 1912 is 209 or one more than last year. Of these, 152 are in charge of District Officers and 57 under Canal Officers. There were 47 inspections by Revenue Officers as against 56 last year. No inspections were made in the districts of Rohtak, Karnal, Jhelum and Multan. On the whole, the gauges have been in good order and the records well kept up.

Rajputana and Ajmer-Merwara.—During the triennial period ending 31st March 1913 there were 416 raingauges as compared with 369 during the year ending 1909-1910. Most of the gauges were inspected during the period under review. Out of 22 gauges in State Dispensaries in Jaipur 5 were not inspected; out of 26 gauges in tahsils and thikanas in Jajpur none were inspected; out of 12 in Bharatpur 1 was not inspected; out of 14 in Dholpur 8 were not inspected; and out of 19 in Alwar 5 were not inspected.

United Provinces.—There were 286 rain-reporting stations in these Provinces including the Meteorological observatories. Out of the 272 stations in charge of District and Canal Officers 189, *i.e.*, 69 per cent, were inspected during the year.

Summary.—It will be seen that in Berar, the Central Provinces, and the Madras Presidency inspection is well carried out and over 95 per cent of the rainfall stations were visited; while the conditions in Mysore approach these, with 85 per cent of stations visited. This inspection is fairly efficient in Bombay and Burma, with about three-fourths of the raingauges inspected, and in the United Provinces with two-thirds. But in Assam the proportion is only 50 per cent, in Bengal 27 per cent and in Kashmir 28 per cent; while in Rajputana even in three years only about half the stations have been visited. In these four areas it can scarcely be expected that the rainfall return should be as reliable as is wanted for administrative as well as scientific purposes.

The System for Storm Warning.

21. The work of warning Indian ports of the approach of cyclonic storms or of bad weather is performed from the Simla Office by the Director-General of Observatories, and from the Calcutta Office by the Meteorologist, Calcutta.

The following ports are warned from Simla for storms in the Arabian Sea:—

Aden, Karachi, Cutch Mandvi, Jamnagar, Dwarka, Porbandar, Veraval, Jafarabad, Bhavnagar, Daman, Bombay, Alibagh, Murud Janjira, Harnai, Ratnagiri, Malvan, Vengurla,

Nova Goa, Mormugao, Karwar, Kumta, Honavar, Mangalore, Tellicherry, Calicut, Cochin Alleppy and Colombo.

The Meteorologist, Calcutta, warns the following ports for storms in the Bay of Bengal:—

Colombo, Tuticorin, Pamban, Negapatam, Cuddalore, Madras, Masulipatam, Cocanada, Vizagapatam, Calingapatam, Gopalpur, Puri, False Point, Chandbali, Balasore, Saugor Island, Diamond Harbour, Mud Point, Budge Budge, Calcutta, Morelganj, Barisal, Goalundo, Narayanganj, Noakhali, Chittagong, Cox's Bazar, Akyab, Diamond Island, Bassein, Rangoon, Moulmein, Tavoy, Mergui, Table Island and Port Blair.

22. In addition to special messages sent during stormy weather the Meteorologist, Calcutta, provides shipping during a large part of the year with daily information regarding the weather over the Bay. This information is made available at the following places by means of daily weather telegrams to an officer at the Port or by the hoisting of flag signals:— Negapatam, Porto Novo, Cuddalore, Madras, Cocanada, Vizagapatam, Calingapatam, Gopalpur, Saugor Island, Sandheads, Chittagong, Akyab, Diamond Island, Elephant Point, Rangoon, Moulmein, Kalagauk and Table Island.

23. In accordance with resolutions passed at the International Radio-Telegraph Conference held in London in June and July 1912, the Indian radio telegraph coast stations are now supplied with telegrams containing meteorological information with regard to the Arabian Sea and the Bay of Bengal for transmission to ships which ask for them. These messages have been sent to the radio stations at Bombay and Karachi from the 10th December and to those at Calcutta, Diamond Island, Table Island and Victoria Point from the 2nd January.

Arrangements are also being made for the receipt by wireless telegraphy of meteorological observations from ships at sea.

Warnings for storms in the Bay of Bengal.

24. During the year warnings were issued for sixteen disturbances. None of these however, developed into severe storms and only two of them were of sufficient importance for a statement to be given here of their course and of the action taken:—

(1) Weather was slightly disturbed in the north of the Bay from the 1st September, and the 8 hrs. observations on the 5th showed a well formed depression over the Sandheads. It moved somewhat rapidly and crossed the coast between Saugor Island and Balasore the same evening.

At Saugor Island, Calcutta and the other ports on the Hughli warning signal number six, indicating a storm of small extent that would probably cross the coast between Chittagong and False Point, was hoisted at about 10·15 hrs. on the morning of the 4th September, and was replaced by warning signal number eight, indicating that the storm would probably cross between Saugor Island and False Point, at about 9·40 hrs. on the morning of the 5th. The signal was lowered at about 22·15 hrs the same evening.

(2) A depression was shown on the morning of the 30th October with its centre off Masulipatam at about 150 miles from the coast. The storm moved very slowly in some direction between north and northwest, and on the following morning its position was just off Waltair. It crossed the coast at about midnight of the 31st October passing over Puri. It was accompanied along its path by heavy rain and high winds.

The action taken with regard to Puri, as representing the part of the coast most affected, is shown by the following telegrams:—

30th October 10·25 hrs. Hoist great danger signal number one. Storm at present moving towards coast near Calingapatam but may curve to north Take precautions. (The signal hoisted indicated that a storm of great intensity was threatening the port and would cross the coast to the south of it).

30th October 11 hrs. Storm signal hoisted at Saugor.

31st October 10·5 hrs. Storm now of considerable intensity still about latitude seventeen or eighteen moving very slowly. May cross today between Waltair and Puri. Take every precaution.

1st November 9·50 hrs. Lower storm signal, storm now inland with centre to west of Midnapore. Weather rough head of Bay but will improve quickly.

1st November 10·34 hrs. Storm signal lowered at Saugor.

Considerable damage was caused in Eastern Bengal by high winds and heavy rain. The usefulness of the warnings issued to that part of the coast may be judged from a letter received from the India General Steam Navigation Company, Calcutta, thanking the Department for "the very satisfactory manner in which their representative at Goalundo was kept informed of the track and intensity of the storm."

25. From the above it would appear that the movements of the storms were correctly anticipated and that the warnings were timely and ample.

WARNINGS FOR STORMS IN THE ARABIAN SEA DURING THE YEAR.

26. There were in the Arabian Sea three storms and six periods of disturbed weather not connected with any definite storm; for all of these warnings were issued.

(1) In October a depression which appeared off Madras on the 21st travelled across the Peninsula out into the Arabian Sea during the 22nd. Its exact course in the Arabian Sea cannot be determined, but the mail steamer which left Aden on the 27th met in Lat. 16 N. Long. 58 E. on the morning of the 30th a strong easterly gale with considerable sea indicating that the depression had increased to a storm and had moved westwards.

On the morning of the 22nd the ports on the west coast of the Peninsula were informed that a depression was crossing the Peninsula and might pass into the Arabian Sea and give rise to squally weather.

The following telegrams were sent to Aden, and similar information was supplied to Indian ports and Colombo :—

23rd October 11·25 hrs. A depression has crossed Peninsula into Arabian Sea near Goa. It is now very shallow but it may intensify and move westward. Hoist cautionary signal.

24th October 11·27 hrs. Disturbance now off Ratnagiri and moving slowly in some northerly direction. Intensity cannot be judged.

25th October 13·0 hrs. At 8 hrs. this morning disturbance a little south of Bombay. Probably has not yet developed into a storm.

26th October 11·48 hrs. No definite indications that storm has yet formed, but area of unsettled conditions appears to be moving towards Kathiawar coast.

27th October 12·0 hrs. Disturbance almost ceased to affect coast stations so that it is either filling up or moving westwards.

28th October 11·37 hrs. No signs of depression in Arabian Sea are visible at coast stations. It has therefore probably filled up but may possibly have moved westwards.

29th October 12·45 hrs. Depression apparently filled up. Lower signal.

(2) Two depressions which passed in quick succession over Ceylon into the south of the Arabian Sea appear to have united into a cyclonic storm on the 20th November, which moved rapidly northwards and struck the coast just north of Bombay at about noon on the 22nd. The storm was very abnormal in the rapidity of its movement and the path it took, and it did considerable damage to Bombay harbour, where five lives were lost and twenty-seven small vessels were wrecked.

The action taken with regard to Bombay as representing the part of the coast most affected is shown by the following warnings :—

17th November 16·5 hrs. Feeble depression passing south Cape Comorin from Bay into Arabian Sea. May give squally weather off Malabar coast.

18th November 11·50 hrs. The depression has now passed into Arabian Sea and probably has its centre near Maldives. Squally weather likely over southeast Arabian Sea.

19th November 11·49 hrs. Another depression has appeared over Ceylon, and will probably move westwards. With the one already in the south of the Arabian Sea may cause squally or rough weather there.

20th November 11·55 hrs. Depression from Ceylon now over Laccadives may develope into storm. Probably move northwestwards at first. Hoist cautionary signal.

21st November 11·52 hrs. Storm apparently formed four hundred miles off Konkan coast. Will probably move towards Kathiawar coast. Lower cautionary hoist warning signal.

22nd November 4·15 hrs. Storm centre approximately two hundred miles west of Bombay. Intensity cannot be determined but probably moderate or considerable. Likely cross coast east of Veraval. Hoist danger signal number two.

22nd November 10·50 hrs. Storm centre at eight hours this morning fifty miles northwest of Bombay. Probably cross coast fifty or hundred miles north Bombay about noon. Lower danger signal number two. Hoist danger signal number three.

22nd November 16·48 hrs. Storm centre passed inland but high winds still possible.

22nd November 22·0 hrs. Storm centre now well inland. Lower signal.

(3) A disturbance developed in the vicinity of Ceylon about the middle of December; on the morning of the 18th it was central near and to the west of Colombo, and on the 19th to the west of Malabar. It probably filled up during the next three days while moving westwards. It was presumably a concentrated disturbance and is reported to have done some damage at Colombo.

The following telegrams were sent to the Malabar coast ports:—

18th December 12·17 hrs. Cyclonic storm formed with centre about hundred miles west of Colombo. Probably move west or northwest. Suggest hoist cautionary signal.

19th December 11·50 hrs. Storm slight intensity passed into southeast Arabian Sea yesterday afternoon, now probably near seventy-two degrees east ten north.

20th December 12·0 hrs. Storm probably now centre Arabian Sea where weather is disturbed south of latitude sixteen.

21st December 11·47 hrs. Weather continues disturbed south of latitude eighteen but position and intensity of disturbance uncertain.

22nd December 11·37 hrs. Disturbance either dissipating or moving away to the westwards. Suggest lower signal.

23rd December 11·24 hours. Disturbance disappeared.

27. In the case of the first storm, as usually happens with storms that pass away to the west, the observations at the coast stations gave little or no indications of its movement; but the warnings given for the second and third were satisfactory.

Flood Warnings and Weather Forecasts to District, Irrigation Railway and other Officers.

28. This work is carried out chiefly by the Simla Meteorological Office, but partly by that of Calcutta. The arrangements have been made at various times, and differ considerably in character, according to the nature and extent of the flood or weather warnings required by the officers concerned. In some cases these officers require telegrams warning them of advancing storms likely to give heavy rain, or of actual heavy rainfall, likely to give rise to severe floods which might injure railways or canal works; and in others they require warnings or forecasts of the weather for as long a period beforehand as possible, so as to enable them to modify their arrangements for carrying on the works under their charge so far as may be necessitated by sudden or large changes of weather.

The number of district officers and officers in the irrigation, railway and other departments requiring warnings from Simla amounted at the end of the year to 127, an increase of 23 during the year.

This number does not include captains of mail steamers and other vessels who occasionally telegraph from Karachi, Aden and other ports for the latest intelligence respecting the position and movement of cyclonic storms, nor does it include the names of other individuals or firms who ask for special forecasts.

29. The number of warning messages sent from Simla during the year 1912-13 was 1,826, as compared with 1,352 in 1911-12 and 2,649 in 1910-11.

The number of warnings for heavy rainfall sent from Calcutta during the year 1912-13 was 455 as compared with 91 in 1911-12.

30. Instructions were issued by the Government of India in 1898 that every officer to whom storm or flood warnings are issued, should in the month of January of each year or in the case of military expeditions at the close of the campaign, forward to the head of this department a brief return of the warnings received during the past year, and should also report:—

(1) Whether the warning telegrams were rapidly transmitted and delivered by the Telegraph Department.

(2) Whether the warnings were timely and satisfactory in every respect, and, if not, in what points they were defective.

(3) Whether any changes might be made in the system which would make the warnings more useful.

Reports on the ordinary storm and flood warnings for the calendar year 1912 were received from 46 officers. Of these 29 reported that the warnings were timely and satisfactory and were rapidly transmitted by the Telegraph Department; 15 offered no remarks and two reported that they had received no warnings during the year.

A comparison of the reports of floods and of heavy rain with the information supplied to the various officers would appear to show that the system is working satisfactorily, and that most of the warnings issued were timely and of use to the recipients. No suggestions were put forward by the officers concerned for changes or improvements in the flood warning service.

SEASONAL FORECASTS.

31. The forecast for the monsoon period of 1912 dated the 8th June, was sent to Local Governments and Administrations, communicated to the press and printed in the Gazette. A statement of the rainfall of June and July with a forecast for August and September was drawn up on the 8th August 1912 and published in a similar manner.

A statement of the actual rainfall during the monsoon period and a comparison of the two forecasts with actual rainfall was drawn up on the 11th January 1913 and sent to Local Governments and Administrations.

The following are summaries of these two forecasts, and a comparison of them with the actual rainfall:—

Forecast, dated 8th June 1912.	Remarks.
(*a*) It appears likely that monsoon rainfall, which is already overdue on the Konkan coast, will be materially later than usual in establishing itself over the country.	The monsoon was not established over the greater part of central and northern India until early in July.
(*b*) The rainfall of the first half of the period is likely to be less abundant and less steady than usual, particularly in northwest India.	The rainfall over India of June was in defect by 28 per cent and the deficiency was over 50 per cent in the United Provinces, the Punjab, the North-West Frontier Province, Rajputana, Central India, the Central Provinces and Hyderabad. The unfavourable conditions lasted until July 6th, but after July 11th the monsoon was unusally vigorous until the end of the month with the exception of a few days.
(*c*) There appears to be no reason for anticipating that the total monsoon rainfall of India as a whole will be in large excess or large defect.	The defect was only 1·74 inches, or 5 per cent.
(*d*) An unusual amount of irregularity in the distribution of rainfall appears likely.	The actual rainfall showed a large amount of irregularity in the distribution over the country in the successive months.

Forecast, dated 8th August 1912.	Remarks.
(*a*) The total rainfall of August and September is likely to be in excess.	The rainfall of August was in excess by 0·71″ or 7 per cent, but that of September was in defect by 1·94″ or 28 per cent.
(*b*) The distribution of rain may be expected to favour the northeast of the Peninsula, the central parts of the country and Rajputana at the expense of the tracts lying north of a line through Dacca, Gaya and Lucknow to Mussooree.	During August in the area for which an excess was predicted it occurred in all the divisions except in Central India East, while in the area for which a defect was anticipated it occurred at the majority of the telegraphic stations representing it. In September, however, the forecast did not hold.
(*c*) It appears improbable that there will be any prolonged general breaks.	This was correct for August but not for September.
(*d*) There is no reason for expecting any unfavourable influence of snowfall upon the monsoon in northwest India.	No such influence was shown.

It may be claimed that the June forecast was correct in its main features; but while the forecast for the second-half of the monsoon period was correct for August it failed for September.

32. A forecast of the probable character of the rains during January and February 1913 was prepared on the 3rd January 1913 and issued in the same manner as the forecast of the previous June. On the 25th July 1913 a comparison of the actual precipitation with the above forecast was issued.

The summary of the forecast issued was—

The indications are unusually conflicting, and do not point to a very severe or a very mild winter. It appears, however, that in the rainfall of northwest India, a defect is more likely than an excess.

The season actually was extraordinarily dry in January and the first half of February, during which period practically no rain fell and very little snow. In the latter half of February, however, the rainfall was nearly four times the average, while the snowfall was in very large excess. The total precipitation of the two months was in this way brought very nearly up to the ordinary amount, both in rain and snow.

Thus the season was of very uncertain character and rainfall was on the whole two per cent in defect. The indications given by the forecast, though not very definite, were fairly correct.

Daily telegraphic weather summary.

33. The summary was despatched daily at about noon.

It was exhibited at certain telegraph offices, and sent to 94 officers of Government. The subscribers, for longer or shorter periods, were 10 newspapers and 47 private individuals.

Publications.

34. There were no changes made during the year in the routine publications of the Department, of which a description will be found in the Departmental Administration Reports of 1907-08 and 1910-11.

The following memoirs of the Indian Meteorological Department were published during the year 1912-13:—

(1) "Data of heavy rainfall over short periods in India"; by Gilbert T. Walker, C.S.I., M.A., Sc.D., F.R.S., Director-General of Observatories. (Memoirs of the Indian Meteorological Department, Volume XXI, Part III.)

(2) "The rapid calculation of times of moonrise and moonset"; by J. H. Field, M.A., and S. M. Jacob, I.C.S. (Memoirs of the Indian Meteorological Department, Volume XXI, Part IV.)

(3) "The liability to drought in India as compared with that in other countries"; by Gilbert T. Walker, C.S.I., M.A., Sc.D., F.R.S., Director-General of Observatories. (Memoirs of the Indian Meteorological Department, Volume XXI, Part V.)

Supply of Meteorological information.

35. In addition to the meteorological information published by the department special information was supplied to the Meteorological Departments of England, Australia and Egypt, and to the Solar Physics Committee, London.

Climatological information, at times involving special calculation, is also provided for sanitary and other officers of Government, as well as for private firms who are willing to pay the expense necessarily incurred. The extent to which the department is utilised in this manner is increasing steadily.

Miscellaneous.

36. Four hundred and thirty-nine books and pamphlets, either purchased or presented by scientific bodies, were added to the Library during the year. The Library is on the whole in fair order.

Nine libraries, observatories or societies were added during the year to the list of institutions to which the publications of the India Meteorological Department are supplied, and sixteen were removed; the number on the list is now 390.

Chief Features of the year.

37. The work of the department may be regarded as having two objects, (1) the directly useful, and (2) the scientific, aiming at ascertaining facts which shall be of practical usefulness in the near future. That which comes most completely under the former heading consists chiefly of the collection and distribution of current weather information, the supply of climatological data, the issue of storm and flood warnings and the provision of time signals. The scientific work includes the experimental and theoretical examination of the physical processes which determine the weather.

38. At the beginning of the year under review there was a serious risk that the Simla gazetted staff would be permanently reduced, and that any scientific enquiries with the object of improving our methods would consequently become impossible while the work of the department would be confined to the mere supervision and publication of meteorological measurements. Happily this disaster has been averted, and sanction was given in July 1912 for a new appointment on the Simla staff. At the same time sanction was given for a scheme of enquiry into the meteorology of the upper air, the sum of three lakhs being granted for ten years' work under the charge of Mr. J. H. Field, whose services were to be entirely given to this purpose. Unfortunately Mr. Field's health had given way under the strain caused by the shortness of staff that had prevailed since 1910, and his absence on furlough prevented all work on the scheme except preliminaries in connection with sending up pilot balloons at Simla and Darjiling and preparations for the new observatory at Agra, which will be the headquarters.

The new assistant at Simla whose appointment was sanctioned in 1912 and who was to have come out last October has not yet arrived. While therefore the ordinary routine work has been efficiently carried out, it has been found impossible to prevent a number of special pieces of work from falling seriously into arrears. As an example of these may be taken the fact that readings of our departmental standard barometer at Calcutta are believed to differ from that at Kew by ·011", and an expensive absolute instrument capable of giving the true correction of our standard to a sufficient degree of accuracy came out from Europe some years ago. In spite however of the desirability of establishing a correct basis of comparison for the barometers of India it has not been possible to spare an officer

from Simla for three weeks to go to Calcutta and perform the somewhat difficult operation of filling and erecting it. From the same cause the Simla gazetted staff has been unable to carry out any systematic scientific enquiry.

On the routine side perhaps the most important changes have been in connection with our marine work. The introduction of installations for wireless telegraphy on a number of ships led to a demand for weather information for ships at sea, and an arrangement was accordingly made that a very short statement should be telegraphed daily to the wireless stations on the coast for transmission to any ship that asked for it. A beginning has also been made with the organisation of a system whereby meteorological observations should be made on ships on certain routes and telegraphed to Simla or Calcutta for use in connection with daily weather work and storm warning: it is obvious that information obtained in this way will at times be of the greatest value and the shipping companies have shown every willingness to co-operate.

Concluding Remarks.

39. The Meteorological Department owes a large part of its usefulness to the sympathetic assistance it receives from outside departments. Civil Surgeons and other officers of the Medical Department, as unpaid superintendents of observatories and in other capacities, help in the daily record of meteorological work; the Telegraph and Postal Departments assist in every way in the rapid transmission of meteorological information, at the same time that they allow their employees to act as observers. The Eastern Telegraph Department, by transmitting the daily Aden message free, and the Indo-European Telegraph Company by giving free transit to the daily records of the Persian observatories, place a large volume of most valuable information at the disposal of the Meteorological Department.

Weekly telegrams were received from the 1st May to the 15th October from the Director of the Royal Alfred Observatory, Mauritius, as well as from the departmental observatories at Zanzibar and Seychelles. These telegrams gave valuable information of the weather conditions in the Indian Ocean and the Department is indebted to the officers indicated for the punctual transmission of the information. Thanks are more specially due to the Director of the Royal Alfred Observatory for his courtesy in placing the meteorological data of that observatory at the disposal of the India Meteorological Department.

The Department is greatly indebted for important information as to meteorological conditions prevailing antecedent to and during the southwest monsoon, to the Director of the Government Observatory, Durban; the Director, Agriculture and Forestry Department, Zomba, British Central Africa; the Meteorologist, Dar-es-Salaam; His Majesty's Commissioner, Entebbe, Uganda; the Director-General, Survey Department, Cairo; the Commonwealth Meteorologist, Melbourne; the Directors of the Observatories at Buenos Ayres and Santiago; and to the various officers around the Indian frontiers who have collected and supplied valuable snowfall information.

The central office of the Meteorological Department at Simla was under the charge of Dr. Walker throughout the year under review and the general administration of the Department was in his hands, while the local officers who have helped very materially with the current work of the Department were as follows:—Calcutta, Mr. C. W. Peake and Dr. E. P. Harrison; Madras, Mr. R. Ll. Jones; Bombay, Mr. H. A. Armstrong and Mr. G. W. Talbot; and Allahabad, Dr. E. G. Hill and Mr. A. P. Sircar.

GILBERT T. WALKER,

Director-General of Observatories.

Simla, the 21st August 1913.

177MRGI—290—24-9-13—GCBP Simla

REPORT

ON

THE ADMINISTRATION

OF

THE METEOROLOGICAL DEPARTMENT

OF

THE GOVERNMENT OF INDIA

IN

1913-14.

CHANGES IN THE STAFF DURING THE YEAR.

Mr. J. H. Field was on privilege leave from 31st August 1912 to 30th November 1912 combined with furlough from 1st December 1912 to 19th October 1913.

Mr. C. W. B. Normand joined the department as Imperial Meteorologist in Simla in October 1913.

Mr. W. A. Harwood was on privilege leave from 15th January 1913 to 13th April 1913. Mr. Bion acted.

Mr. J. Evershed was deputed to New Zealand from 11th December 1913 to 10th March 1914. He was on privilege leave from 4th August to 3rd November 1913. Dr. Royds acted.

Mr. C. W. Peake was on combined leave from 17th April 1913 to 16th December 1913 which was extended to 1st February 1914. Dr. Harrison acted.

Dr. E. G. Hill was on leave from 29th April 1913 to the end of the year. Dr. A. P. Sircar acted.

Mr. R. Ll. Jones was on furlough from 3rd April 1913 to 30th November 1913. Messrs. Simonson and Littlehailes acted.

Dr. Royds was on privilege leave from 14th to 28th March 1914.

OBSERVATORIES.

2. The observatories maintained by the Government of India are classified as follows :—

First Class.—Observatories which are furnished with autographic instruments for continuously recording pressure, temperature, humidity, and wind direction and velocity, in addition to instruments read by eye.

Second Class.—Observatories at which readings are taken daily at 8 hrs., 10 hrs., and 16 hrs.: those at 8 hrs. are (with a few exceptions) transmitted by telegram to one or more of the offices at Simla, Calcutta, Bombay and Madras for inclusion in the India or Provincial Daily Weather Reports.

Third Class.—Observatories—

(a) where readings are taken daily at 8 hrs. only; at those stations where there are telegraph offices the observations are transmitted by telegram for inclusion in the Simla, Calcutta, Bombay or Madras Daily Weather Reports;

(b) at stations where there are no telegraph offices, and observations are recorded at 10 hrs. and 16 hrs. only; these are included in the Monthly Weather Reviews, and furnish a series of observations for the determination of monthly and daily means which should be comparable with the means already obtained for second class observatories.

Fourth Class.—Observatories at which observations of temperature, wind and rainfall only, or of temperature and rainfall only are recorded.

Fifth Class.—Observatories which telegraph rainfall only.

3. At the end of the year the total number of observatories was 289 of which 50 were non-departmental and 239 were maintained by the Government of India. Of the 239 departmental observatories, 7 were first class, 3 second class, 184 third class, 24 fourth class, and 21 fifth class.

4. The third class observatory at Hambantota under the superintendence of the Director Colombo Observatory started sending daily observations to this department from the 15th August 1913, and a fifth class observatory was opened at Parbhani on 1st May 1913.

As regards departmental observatories, the following were the changes:— a third class observatory was opened at Lyallpur on 18th August 1913; a fifth class observatory was opened at Mussoorie on 26th October 1913; and the observatory at Ootacamund was reduced from second to third class on 17th June 1913.

First Class Observatories.

5. The Directors of the Observatories of Kodaikanal, Madras and Bombay publish separate annual reports which are forwarded for the information of Government. It has accordingly been ruled as unnecessary to include information relating to the working of these observatories in this Administration Report.

6. At Alipore (Calcutta), Allahabad and Lahore the following special instruments were in use during the year:—

Alipore.	Allahabad.	Lahore.
Bergholz barograph.	Beckley anemograph.	Draper barograph.
Kew barograph.	Richard barograph.	Richard barograph.
Kew thermograph.	Richard thermograph.	Casella rain-gauge.
Richard thermograph.	Stokes sunshine recorder.	Beckley anemograph.
Beckley anemograph.	Solar radiation thermometers.	Sunshine recorder.
Dines' pressure tube anemometer.	Grass thermometer.	Grass thermometer.
Beckley rain-gauge.	Ground thermometer.	Nephoscope.
Monthly rain-gauge.	Nephoscope.	Ground thermometer.
Hellman Fuess rain-gauge.	Lawrence and Mayo self-recording rain-gauge.	
Milne seismograph.		
Grass thermometer.		
Ground thermometer.		
Nephoscope.		

7. *The Alipore Observatory.*—This observatory is under the charge of the Meteorologist, Calcutta.

The autographic instruments have on the whole worked satisfactorily during the past year.

All instruments issued by the Meteorological Department are tested at this observatory and their corrections ascertained before they are sent out for use. The number of instruments tested and verified during the year was 768 as compared with 1,207 last year. 66 instruments were condemned as unfit for issue, or were sent to the India Office for repair and 15 instruments were kept in store for future treatment. In addition to the above, 268 instruments were examined and issued to other observatories.

The observatory gives mean Calcutta time to the port and shipping. Three time balls are dropped daily at 1 P M., local mean time throughout the year, one on the Semaphore Tower at Fort William, the second at the Port Commissioners' office and the third at the Kidderpore Docks.

This work was carried out quite satisfactorily as far as this department is concerned. There were 36 failures as compared with 15, the average number of the past 25 years; but in all cases they were due to defects in the electric or mechanical arrangements outside the observatory, for which this department is not responsible.

Year.	Number of days on which one or other ball failed to drop properly.	Number of failures due to telegraphic defects.
1913-1914	36	36
1912-1913	50	50
1911-1912	21	21
1910-1911	21	20
1909-1910	28	27

8. *The Allahabad Observatory.*—This observatory is under the charge of the Meteorologist, Allahabad.

Beckley anemograph.—This instrument worked somewhat better during the year under review than it did the previous year. There were fourteen breaks which were due principally to the stopping of the clock.

Richard barograph.—This instrument again gave excellent tracings throughout the year: all the charts have been tabulated.

Richard thermograph.—The wet bulb tracings went wrong in Octobor 1912 and its use was discontinued. The dry bulb tracings, with a few exceptions, have been good.

Sunshine recorder.—This gave good results with a break.

Nephoscope.—Regular observations were made with the Duboscq instrument.

Readings of all the eye instruments were taken every two hours from 8 hours to 18 hours. The earth thermometer on the surface was read at 14 hours. In addition to the ordinary observations, special observations of cloud for use at the Aerological Observatory at Agra have been taken since 1st March 1914.

9. *The Lahore Observatory.*—Eye observations of the ordinary Meteorological instruments were taken seven times daily at this observatory as in past years at 6, 8, 10, 14, 16, 18 and 22 hrs. Ground surface temperature was recorded four times daily at 6, 10, 16, and 22 hrs.

Character of the work of Observation at second and third class observatories.

10. The general character of the work of the observatories, as judged by the number of mistakes made by observers was satisfactory.

The number of stations of great reliability, in which either no mistake or only one mistake has been detected in the data for the Indian Daily Weather Report, was 39 as against 45 in 1912-13; while, the number of stations at which more than 50 mistakes were made was 11 as against 18 last year.

These results are of interest in connection with the fact that on the 1st January 1914 was intruduced the new code for telegraphing observations in figures instead of in words; the change effects a saving of time both in preparing and decoding the messages.

The usual list showing the number of mistakes in observation and in the preparation of telegrams for all the observatories which send weather telegrams to the Simla office was prepared and circulated to the observatories on the 27th August 1914.

Inspection of Observatories.

11. The number of visits paid to observatories during the year under review was 69 as compared with 56 in the previous year and an average of 60 during the past 10 years.

The Director-General inspected the observatories at Calcutta, Bombay, Alibag, Madras, Kodaikanal, Lahore, Bikaner and Karachi; Mr. Hem Raj inspected 26; Mr. Gaetane 20; Mr. Subrahmanyam 9; Mr. V. Daraiswamy Iyer 1; the Chief Observer, Allahabad 1; Mr. Mukerjhi 1; Mr. Biswas 2; and Mr. Ahmed-Ullah 1.

Of the 63 second or third class observatories that were visited 34 were reported as good, 23 as tolerable and 6 as bad.

Condition.	Second or third class observatories inspected in					
	1913-14.	1912-13.	1911-12.	1910-11.	1909-10.	1908-09.
Good or satisfactory	34	31	20	23	25	40
Tolerable	23	17	16	31	11	20
Bad	6	3	1	3	4	2
Total ...	63	51	37	57	40	62

In estimating the general character of the observatories from the above table it must be remembered that it is, as a rule, on account of something unsatisfactory that a visit of inpection is made. The general level of the stations is thus decidedly better than might otherwise appear. The most frequent cause of bad work is the changing of observers at short intervals necessitated by acting and other arrangements in the Medical, Telegraphic and Postal Departments.

Special Observations.

12. Observations other than those recorded by local observers at regular intervals are made as follows:—

(*a*) In accordance with orders issued from the Simla or Calcutta office, when weather is disturbed and storm warnings may have to be issued: such observations are sent by telegraph. Certain observers at coast observatories are in receipt of a regular monthly allowance of Rs. 5 for sending special storm warning telegrams, while other observers receive an allowance of Re. 1 for each set of special observations sent under instructions from either Simla or Calcutta. The number of telegrams of the latter class forwarded during the year under review was 529, as compared with 607 despatched the previous year.

(*b*) Certain observers, when they consider that conditions at sea are sufficiently threatening, send of their own initiative to Simla or Calcutta a telegram containing special observations. Seven such telegrams were received.

(*c*) In connection with flood warning a number of observers have been instructed to send telegrams announcing the occurrence of heavy rainfall to Government officers and railway engineers who desire early information. The number of telegrams so sent was 126 as compared with 159 last year.

(*d*) Observers are instructed to send detailed information of earthquakes to the Simla Meteorological office and to the Director, Geological Survey, Calcutta: for this work they are paid awards from this department. Of such reports 79 were received during the year.

Observations with special Meteorological Instruments.

13. The following special observations were carried out during the past year at certain selected stations:—

1st—Wind observations recorded by Beckley anemographs at 11 stations, and by Dines' pressure tube anemometers at 4 stations.

2nd—Solar and terrestrial radiation observations at 3 and 10 stations, respectively.

3rd—Underground temperature observations at 2 stations.

4th—Sunshine observations at 7 stations.

5th—Barometric observations recorded by self-registering instruments, chiefly Richard barographs, at 18 stations.

6th—Temperature observations recorded by self-registering instruments, chiefly Richard thermographs, at 11 stations.

Observations of solar energy in absolute units.

14. Observations were continued at Simla throughout the year, when weather conditions allowed, by means of Angstrom's electric pyrheliometer.

Observations in the upper air.

15. Delay in the building work of the observatory at Agra necessitated the employment of such temporary quarters there as could be obtained, and shortly after the return of Mr. Field from leave in October work with pilot balloons was started in Agra. At Simla balloons were sent up almost daily throughout the year and at Darjiling similar work was done during the period preceding the monsoon of 1913. The more serious parts of the intended work at Agra and elsewhere cannot be begun until some months after the completion of the observatory buildings. Reductions of past observations progressed far towards completion during the year, and the analysis by Mr. Harwood of anemograph records at six stations in India was completed for publication in the departmental memoirs.

Researches by the Simla Staff.

16. It was not found possible to carry out any continuous experimental investigations at Simla, but a special grant for a computing staff enabled progress to be made with work of a statistical character. The tabulation of the past rainfall of Irdia which had suffered in accuracy from frequent changes in the past normals was carried out afresh on a uniform system. An examination was made of the extent to which a forecast of the monsoon rainfall could be derived from the temperature of India, from the pressure of India in the previous year and from the quantity of ice off Cape Horn; and some advance was made in the problem of forecasting the local distribution of monsoon rainfall. A substantial contribution towards our knowledge of Indian daily weather also was made in the compilation of 125 charts illustrating important types of weather for future reference and study.

Seismograph Observations.

17. Seismological observations were recorded by two Omori-Ewing seismographs at Simla and one at Bombay; by Milne seismographs at Alipore (Calcutta), Kodaikanal and

Colaba (Bombay); and by means of other self-registering instruments at the last named station. All the instruments worked satisfactorily throughout the year, and copies of the records of the Milne's seismographs were transmitted to the Seismological Committee of the British Association.

Marine Meteorology.

18. No change was made during the year under review in the method of collecting marine information.

At Calcutta and Bombay a clerk at each port spends his whole time in visiting ships, making in each case a copy of the log and a comparison of the ship's barometer with a secondary standard, for the purpose of applying the necessary corrections to the readings in the logs; and, after the barometer comparisons have been made a statement of the error of the ship's barometer is given to the captain, in case he should desire to make use of it. The number of ships visited is materially less than that of the vessels which come into port, but it is ample for the purposes of the department.

The data thus obtained are utilised in the preparation of charts of disturbances in the Bay of Bengal and the Arabian Sea for future reference in connection with the storm warning work of the department, and in drawing up an account of the storms of the year for publication in the Annual Summary.

The arrangements made with the London Meteorological Office, the Royal Alfred Observatory at Mauritius, and the Deutsche Seewarte, Hamburg, for collecting marine data from the whole of the Indian Ocean, have been continued and the thanks of this department are again due to these three offices for thus supplying a large amount of useful data.

Observations recorded during the year at the entrance of the River Hughli were supplied to the Meteorological Department by the light-vessels "Comet" and "Luna."

Snowfall Registration in the Mountain Districts to the North and West of India.

19. The information as to the amount, distribution and time of occurrence of the snowfall in the Himalayan and Afghan mountain areas was on the whole tolerably complete, and the thanks of the department are again due to the various officers who have collected and forwarded it. Additions to the information received have been obtained by continuing the series of large-scale photographs of the snows, as seen from Simla, which was started in 1905.

Rainfall Registration.

20. The registration of rainfall in India has invariably been carried out by the provincial authorities. In 1889 a uniform system was introduced by the Government of India, and the Director-General of Observatories was made consulting officer in connection with this work. His advice is sought regarding the starting of new raingauge stations, and he receives annual reports from the local officers responsible for the registration of rainfall upon the efficiency of the work. A general account of the system, which came into operation in the year 1891-92, will be found on pages 5-8 of the Administration Report of the year 1889-90, and on pages 6 and 7 of the Administration Report for the year 1890-91.

The following is a statement of the number of rain-gauge stations from which data were being received for publication in the Rainfall Data of India at the end of the year under review :—

Province or Division.	Number of rain gauges supplying returns for publication on 31st March 1914.	Province or Division.	Number of rain-gauges supplying returns for publication on 31st March 1914.
Burma	200	Baluchistan	94
Assam	125	Rajputana	185
Bengal	225	Bombay and Sind	289
Bihar and Orissa	281	Central India	117
United Provinces	277	Central Provinces	174
Punjab	188	Hyderabad	22
Kashmir	37	Mysore	77
North-West Frontier Province ...	33	Madras (including Pudukkottai, Coorg, Travancore and Cochin).	502

The following paragraphs give a brief summary of the reports of the officers in charge of rainfall registration for the year 1913-14 :—

Assam.—The total number of rainfall stations was 125 against 124 in the preceding year. The number of gauges inspected was 91 or an increase of 29 over the previous year. In Cachar and Nowgong more than half the raingauges remained without inspection. Inspections of 38 raingauges were made more than once.

Baluchistan.—There were at the close of the year 95 raingauges : of these 45 were maintained by the railway department at railway stations, while 42 (excluding those attached to departmental observatories) were under the civil and irrigation departments. Seventeen rainfall stations were inspected, and the results were, on the whole, satisfactory.

Bihar and Orissa.—The total number of rain-registering stations during the year was 282 (including 22 stations situated in the Feudatory States and Tributary Mahals) against 258 last year. 150 stations were inspected and 111 inspection cards were received against only 34 cards received last year. The raingauges were mostly in good condition and registration work was generally done satisfactorily in most of the districts.

Bengal.—The number of rainfall stations remained the same as last year, 225. Of these, only 48 were inspected, while last year 60 were inspected, and the year before 108. There is need to impress upon rainfall registration officers the necessity for more regular and systematic inspection in future.

Bombay and Sind.—There were 276 raingauges (excluding those in Native States) of which 213 were inspected during the year under review against 209 inspected last year—101 were inspected more than once and the total number of inspections amounted to 355 against 299 in the preceding year. Sufficient attention was not paid to the work in three districts of the Deccan, two each in the Karnatak and Gujarat and one each in Konkan and Sind, and the attention of the Collectors concerned is being invited to the matter. As regards Native States, 38 gauges only (out of 61) were inspected against 41 last year and 44 the year before. Seven raingauges were inspected more than once against four last year.

Burma.—As reported last year there are 200 rain-recording stations of which 19 are meteorological observatories and 26 in charge of the Public Works Department. 156 raingauges were inspected, or 2 in excess of last year. Of these, 106 were found in good, and 50 in a fair, condition.

Central Provinces.—The number of raingauges maintained during the year was 112 against 111 in the previous year. The number of inspections of which reports were received was 121 against 133 in the preceding year. The results during the year were on the whole satisfactory.

Hyderabad—Information not yet received.

Kashmir.—There are 36 rain-recording stations in the state of which 8 are meteorological observatories and the remainder are in charge of the Revenue Department. The number of inspections of raingauges of which reports were received was 5 only against 10 inspected last year. The local authorities are being addressed by the local Government in the matter.

Madras.—There were 475 rain-recording stations at the close of the official year of which 391 were in the Madras Presidency. The number of stations inspected was 377 as against 389 inspected the previous year.

Mysore.—At the close of the calendar year 1913 there were 223 rain-recording stations as against 220 in the previous year. Out of these 193 or 87 per cent were inspected as compared with a percentage of 85 last year.

North-West Frontier Province.—The report on rainfall registration contained in the current administration report of the North-West Frontier Province refers to the year 1912-13 and states that the raingauges and rainfall registers were maintained in good condition. A new raingauge was established at the Tarnab Agricultural Farm.

Punjab.—The total number of raingauges in the Punjab during the calendar year 1913 was 222 or 13 more than last year. Of these, 152 were in charge of district officers and 70 under canal officers. There were 51 inspections against 47 last year. The raingauges under both district and canal officers are reported to be in good order and the records well kept up.

United Provinces.—There were 287 rain-reporting stations in these Provinces including the meteorological observatories. Out of the 273 stations under the supervision of district and canal officers, 160, *i.e.*, 58 per cent, were inspected during the year.

Summary.—In the Central Provinces, Madras, Mysore, Bombay and Burma, over 75 per cent of the rainfall stations were inspected ; in the United Provinces, Assam, and Bihar over 50 per cent ; Bengal 21 per cent ; Punjab 23 per cent ; Baluchistan 18 per cent ; and Kashmir 14 per cent.

The System for Storm Warning.

21. The work of warning Indian ports of the approach of cyclonic storms or of bad weather is performed from the Simla Office by the Director-General of Observatories, and from the Calcutta Office by the Meteorologist, Calcutta.

The following ports are warned from Simla for storms in the Arabian Sea.—

Aden, Karachi, Cutch Mandvi, Jamnagar, Dwarka, Porbandar, Veraval, Jafarabad, Bhavnagar, Daman. Bombay, Alibagh, Murud Janjira, Harnai, Ratnagiri, Malvan, Vengurla, Nova Goa, Marmagao, Karwar, Kumta, Honavar, Mangalore, Tellicherry, Calicut, Cochin, Alleppy and Colombo.

The Meteorologist, Calcutta, warns the following ports for storms in the Bay of Bengal:—

Colombo, Tuticorin, Pamban, Negapatam, Cuddalore, Madras, Masulipatam, Cocanada, Vizagapatam, Calingapatam, Gopalpur, Puri, Hukitala (False Point), Chandbali, Balasore, Saugor Island, Diamond Harbour, Mud Point. Budge Budge, Calcutta, Morelganj, Barisal Goalundo, Narayanganj, Noakhali, Chittagong, Cox's Bazar, Akyab, Kyaukpyu, Diamond Island, Bassein, Rangoon, Moulmein, Tavoy, Mergui, Table Island and Port Blair.

22. In addition to special messages sent during stormy weather the Meteorologist, Calcutta, provides shipping during a large part of the year with daily information regarding the weather over the Bay. This information is made available at the following places by means of daily weather telegrams to an officer at the Port or by the hoisting of flag signals:—

Negapatam, Porto Novo, Cuddalore, Madras, Cocanada, Vizagapatam, Calingapatam, Gopalpur, Saugor Island, Chittagong, Akyab, Elephant Point, Rangoon, Moulmein, Kalagauk and Sabang.

23. In accordance with resolutions passed at the International Radio-Telegraph Conference held in London in June and July 1912, the Indian radio-telegraph coast stations are now supplied with telegrams containing meteorological information with regard to the Arabian Sea and the Bay of Bengal for transmission to ships which ask for them. These messages are sent to the radio stations at Bombay, Karachi, Calcutta, Sandheads, Diamond Island, Table Island and Victoria Point.

Arrangements were also made for the receipt by wireless telegraphy of meteorological observations from ships at sea, and the system was introduced during the year. It has worked satisfactorily.

Warnings for Storms in the Bay of Bengal.

24. During the year warnings were issued for nineteen disturbances. Only two of these however developed into storms of any severity and only three were of sufficient importance for a statement to be given here of their course and of the action taken:—

(1) A depression formed on the 22nd July to the east of the Sandheads. It intensified considera' ly on the 22nd but remained stationary, and on the morning of the 23rd it had developed into a storm of considerable severity with an inner area in which a strong gale was blowing. The centre crossed the coast somewhat east of Saugor Island on the evening of the 24th moving in a west-northwesterly direction.

The Bay ports that were likely to be affected by the disturbance or from which ships might run into it were informed daily from the 22nd. At Saugor Island, Calcutta and the other ports on the Hugli the daily flags had shown on the 22nd that weather was unsettled; warning signal No. 7, indicating that a cyclonic storm of small extent and intensity would probably move northwards between Saugor Island and Chittagong, was ordered to be hoisted at about 10-30 hours on the morning of the 23rd, and orders were sent at 12-30 next day for replacing it by danger signal No. 9, indicating the approach towards Saugor roads of a cyclonic storm of small extent. This signal was lowered at about 8 hours on the morning of the 25th.

(2) A depression was shown on the morning of the 28th July on the Chittagong coast. It intensified rapidly during the next 24 hours and on the evening of the 29th became a storm of unusual severity with winds of hurricane violence

and tremendous seas. It moved in a westnorthwesterly direction and crossed the coast between Saugor Island and Calcutta on the night of the 30th.

The warnings issued were similar to those used for the preceding storm. Warning signal No. 7 was ordered to be hoisted at about 5 hours on the morning of the 30th at Saugor Island, Calcutta and the other ports on the Hugli, and was ordered to be replaced by danger signal No. 9 about 5 hours later. Orders for lowering the signal were sent at about 8 hours on the morning of the 31st.

(3) A depression appeared to be forming in the Bay off the north Madras coast on the 10th October. It developed into a storm of moderate intensity and moved slowly in northnorthwesterly direction, its centre being roughly 120 miles east of Calingapatam on the morning of the 13th. It crossed the coast between Puri and Gopalpur the same evening.

The action taken with regard to Puri and Gopalpur, as representing the part of the coast most affected, is shown by the following telegrams: —

PURI.

10th October 11·40 hrs. Depression formed 200 or 300 miles southeast of Calingapatam. May move northwest or north.

11th October 10·58 hrs. Hoist warning signal. Depression still about 250 miles southeast of Calingapatam is developing into storm. (The signal hoisted indicated that a storm had formed which would probably advance to that part of the coast on which the port was situated but was still at a considerable distance from it).

12th October 11·48 hrs. Small storm at 8 hrs. about Lat. 17-30, Long. 86-30 moving north.

October 13th 11·32 hrs. Lower warning signal and hoist danger signal No. 2. Storm at 8 A.M. was about 170 miles east of Calingpatam moving north or northnortheast. (The danger signal hoisted indicated that a storm probably of slight to moderate intensity was affecting the port and that its centre would probably cross the coast considerably to the north of the port).

14th October 11·22 hrs. Storm curved to west and crossed coast between Puri and Gopalpur last night.

GOPALPUR.

For this port the action taken was identical except that from the message of the 13th, the words 'Lower warning signal and hoist danger signal No. 2' were omitted.

The present signals of the Hugli ports are not very well adapted for a storm of unusual violence during the rains; and hence the warnings of (1) and (2) underrated the severity of the storms. In the case of (2) it is possible that orders for hoisting the storm signal should have been issued at 10-30 on the 29th.

The warnings for the storm (3) were somewhat affected by the incorrect impression formed as to the position of the storm on the morning of the 13th which led to the view that the storm was travelling north or northnortheast. The signals hoisted at Puri were timely and correct except that they indicated that the storm would cross to the north instead of the south. At Gopalpur, since this port was not regarded as seriously threatened on the 13th, the danger signal was not hoisted: but probably the precautions taken in such cases on the warning and the danger signal are largely identical.

WARNINGS FOR STORMS IN THE ARABIAN SEA DURING THE YEAR.

25 There were 14 periods of disturbed weather in the Arabian Sea for which warnings were issued but none of these disturbances except one developed into a storm. The one exception was of a very unusual kind as it was a winter depression which passed eastwards along the Mekran coast in the month of February, and gave strong winds and rough seas to the west of Karachi. Warnings were issued on the 13th February to all ports on the west coast as far

south as Bombay, and danger signals were hoisted at Karachi and the Kathiawar ports. The storm was shortlived and had passed inland by the morning of the 14th. The following telegrams were sent to Karachi :—

13th February 11-57 hrs. There is a deep disturbance near Pasni travelling eastwards; weather should be watched. Hoist danger signal number three. (The signal hoisted indicated that a storm of slight or moderate intensity was affecting the port and that it would probably cross the coast over or near to the port).

14th February, 11·30 hrs. Disturbance passed inland. Lower signal.

The unusual character of the disturbance is shown by the fact that this is the only instance on record of a danger signal being hoisted at any of the Arabian Sea ports during the winter.

26. There were thus four serious disturbances in the year, and warnings for all were issued either by Simla or Calcutta; further the information given was fairly correct and timely.

Flood Warnings and Weather Forecasts to District, Irrigation, Railway and other Officers.

27. This work is carried out chiefly by the Simla Meteorological Office, but partly by that of Calcutta. The arrangements have been made at various times, and differ considerably in character, according to the nature and extent of the flood or weather warnings required by the officers concerned. In most cases these officers require telegrams warning them of advancing storms likely to give heavy rain, or of actual heavy rainfall, likely to give rise to severe floods which might injure railways or canal works; and in others they require warnings or forecasts of the weather for as long a period beforehand as possible, so as to enable them to modify their arrangements for carrying on the works under their charge so far as may be necessitated by sudden or large changes of weather.

The number of district officer and officers in the irrigation, railway and other departments requiring warnings from Simla amounted at the end of the year to 132 an increase of 5 during the year.

This number does not include captains of mail steamers and other vessels who occasionally telegraph from Karachi, Aden and other ports for the latest intelligence respecting the position and movement of cyclonic storms, nor does it include the names of other individuals or firms who ask for special forecasts.

28. The number of warning messages sent from Simla during the year 1913-14 was 1,840, as compared with 1,826 in 1912-13 and 1,352 in 1911-12.

The number of warnings for heavy rainfall sent from Calcutta during the year 1913-14 was 447 as compared with 455 in 1912-13.

29. Instructions were issued by the Government of India in 1898 that every officer to whom storm or flood warnings are issued, should in the month of January of each year or, in the case of military expeditions, at the close of the campaign, forward to the head of this department a brief return of the warnings received during the past year, and should also report:—

(1) Whether the warning telegrams were rapidly transmitted and delivered by the Telegraph Department.

(2) Whether the warnings were timely and satisfatory in every respect, and, if not, in what points they were defective.

(3) Whether any changes might be made in the system which would make the warnings more useful.

Reports on the ordinary storm and flood warnings for the calendar year 1913 were received from 47 officers. Of these 26 reported that the warnings were timely and satisfactory and were rapidly transmitted by the Telegraph Department; 19 offered no remarks, one reported that he had received no warnings during the year, and one complained that he had not been adequately warned of the October storm that struck the coast near Gopalpur.

A comparison of the reports of floods and of heavy rain with information supplied to the various officers would appear to show that the system is working satisfactorily, and that most of the warnings issued were timely and of use to the recipients. No suggestions were put forward by the officers concerned for changes or improvements in the flood warning service.

Seasonal Forecasts.

30 The forecast for the monsoon period of 1913 dated the 8th June, was sent to local Governments and Administrations, communicated to the press and printed in the Gazette. A statement of the rainfall of June and July with a forecast for August and September was drawn up on the 9th August 1913 and published in a similar manner.

A statement of the actual rainfall during the monsoon period and a comparison of the two forecasts with actual rainfall was dawn up on the 29th December 1913, and sent to Local Governments and Administrations.

The following are summaries of these two forecasts, and a comparison of them with the actual rainfall :—

Forecast, dated 8th June 1913.	Remarks.
(*a*) The indications are not sufficiently decided to justifiy a forecast that the total monsoon rainfall of India will be in excess or defect. All that can be inferred is that a large excess or large defect is unlikely.	The total monsoon rainfall was in defect only by 1·88 inches, or 5 per cent.
(*b*) There is no ground for anticipating that accumulations of snowfall will exert a prejudicial influence on rainfall in northwest India.	There was no excess of snow and no prejudicial influence. Rainfall in the Punjab Southwest and the North-West Frontier Province was in excess.

Forecast, dated 9th August 1913.	Remarks.
(*a*) The total rainfall of August and September will probably be normal or in slight defect.	The total rainfall was in defect by 3·34 inches or 20 per cent.
(*b*) In northwest India the monsoon is not likely to be affected prejudicially by snowfall.	There was no excess of snowfall and no prejudicial influence. The deficiency of rain in northwest India was due to the early withdrawal of the monsoon.

Taking first the anticipations regarding the total amount of rainfall, the June forecast that it would not be very abnormal was correct: the existing drought in parts of central and north India is due mainly to irregular distribution of the rainfall and its concentration in the earlier part of the season. The August forecast that the rainfall of the latter half of the period would be normal or in slight defect was too optimistic: the actual defect was large. It may be pointed out, however, that the pressure as derived from the cable from Mauritius was incorrect, being too low by ·025" for May and ·03" for July; so that instead of being favourable in both months, as stated in the forecasts, pressure there was in reality unfavourable. But for this a somewhat less hopeful view of the

season's prospects would have been taken. Both forecasts were correct in anticipating no prejudicial influence of snowfall in northwest India.

31. A forecast of the probable character of the rains during January and February 1914 was prepared on the 22nd December 1913 and issued in the same manner as the forecast of the previous June. On the 11th June 1914 a comparison of the actual precipitation with the above forecast was issued.

The summary of the forecast issued was :—

It is probable that the rainfall of northern India will be in excess, though not to a large extent: and that the snowfall in the neighbouring hills will be approximately normal.

Actually both rainfall and snowfall were in defect in January in northern India taken as a whole; but they were in excess in February, especially as regards snowfall. Thus the rainfall of the two months was on the whole approximately normal and the snowfall in slight or moderate excess. The anticipations for rain were somewhat too sanguine and those for snow not quite sanguine enough.

Daily telegraphic weather summary.

32. The summary was despatched daily at about noon.

It was exhibited at certain telegraph offices, and sent to 97 officers of Government. The subscribers, for longer or shorter periods, were 10 newspapers and 51 private individuals.

Publications.

33. There were no changes made during the year in the routine publications of the Department, of which a description will be found in the Departmental Administration Reports of 1907-08 and 1910-11.

The following memoirs of the Indian Meteorological Department were published during the year 1913-14:—

"Potential Gradient at Simla, India"; by G. C. Simpson, D.Sc., (Memoirs of the Indian Meteorological Department, Volume XXI, Part VI).

"The cold weather storms of Northern India," Part I by Gilbert T. Walker, C.S.I., M A., Sc. D., F.R.S., Director-General of Observatories; Part II by Rai Bahadur Hem Raj, Imperial Meteorologist. (Memoirs of the Indian Meteorological Department, Volume XXI, Part VII).

"Monthly and annual rainfall normals", by Gilbert T. Walker, C.S.I., M.A., Sc D., F.R.S, Director-General of Observatories. (Memoirs of the Indian Meteorological Department, Volume XXII, Part I).

"Monthly and annual normals of number of rainy days", by Gilbert T. Walker, C.S.I., M.A., Sc. D., F.R.S., Director-General of Observatories. (Memoirs of the Indian Meteorological Department, Volume XXII, Part II).

Supply of Meteorological information.

34. In addition to the meteorological information published by the department special information was supplied to the Meteorological Departments of England, Australia and Egypt, and to the Solar Physics Committee, London.

Climatological information, at times involving special calculation, is also provided for sanitary and other officers of Government, as well as for private firms who are willing to pay the expense necessarily incurred. The extent to which the department is utilised in this manner is increasing steadily, as will be seen from the chart appended.

Miscellaneous.

35. Eight hundred and seventy-seven books and pamphlets, either purchased or presented by scientific bodies, were added to the Library during the year. The Library is on the whole in fair order.

Nineteen libraries, observatories or societies were added during the year to the list of institutions to which the publications of the India Meteorological

Department are supplied, and sixtyseven were removed; the number on the list is now 342.

Chief Features of the year.

36. The work of the department may be regarded as having two objects, (1) the directly useful, and (2) the scientific, aiming at ascertaining facts which shall be of practical usefulness in the near future. That which comes most completely under the former heading consists chiefly of the collection and distribution of current weather information, the supply of climatological data, the issue of storm and flood warnings and the provision of time signals. The scientific work includes the experimental and theoretical examination of the physical processes which determine the weather.

Among the projects of the year that may exercise an important influence on the directly useful work of the department is that submitted to Government for reorganising the system of storm warning in the Bay of Bengal and Arabian Sea, and for distributing information to ports and shipping with regard to daily weather. The proposals were drawn up after informal consultations with representatives of commercial and shipping interests and have been circulated to local Governments so that the views may be ascertained of those chiefly affected. Experiments also have been made as to the distance at which day-signals of various shapes and sizes can be distinguished.

During the year progress has been made with the scheme for securing weather observations from ships by wireless telegraphy; a suitable code has been drawn up, tried by a certain number of ships, and printed; and it is clear that at times the information afforded will have great value. It is unfortunate from this standpoint that a large number of the regular tracks of steamships are so close to the land that their observations add little to what is given by our shore stations.

A visit of Dr. Walker to Colombo has resulted in closer co-operation between the meteorological work of India and Ceylon; a daily telegram to Simla and Calcutta has been arranged from Hambantota which will be of great service when warning for storms that form to the southeast of Ceylon.

In order to improve the daily weather forecasts and the system of warning for heavy rain that depends on them, a special grant of money was devoted to the formation of a collection of charts of representative 'types' of Indian weather under the direction of Rai Bahadur Hem Raj. The value of such a collection both for immediate application and for scientific research is obvious.

In 1904, when the normals of rainfall, temperature, etc., were last published, they were based on data up to 1899; and another revision has of late become desirable. This has been effected, and while the normals of rainfall as far as 1910 have been published those of temperature, humidity, cloud and pressure are now in the press.

Sanction was given in 1912 for the appointment at Simla of a new gazetted assistant, in order that scientific researches and consequent improvement in our methods should not become impossible; and three lakhs were given for a scheme of enquiry into the conditions of the upper air to be carried out in ten years by Mr. J. H. Field, whose services were to be entirely given for the purpose. The new assistant Mr. C. W. B. Normand arrived in October and Mr. Field whose health had broken down was able to return to duty in October last. Unhappily the observatory that was being erected for him at Agra was not completed during the year under review and he, with Mr. Harwood his assistant, were forced to occupy temporary quarters; it was not possible to fit up a temporary workshop and laboratory for the few months involved, and their activity was largely confined to work with pilot balloons at Agra and Simla, together with the discussion of data previously accumulated.

Such advances as have been made hitherto in monsoon forecasting have dealt more with the rainfall of India as a whole than with its geographical distribution. Indications regarding the latter had been looked for by Sir John Eliot

in the pressure distribution of India in May, but all methods based on this had failed. When therefore a small computing staff became available a thorough examination of the conditions by strict statistical methods was undertaken. It transpired that the pressure distribution of May had no appreciable influence on the distribution of the succeeding rainfall, but that some of the extra-Indian conditions were of considerable importance: this line of enquiry has shown that the rainfall of certain districts, such as Malabar and Lower Burma, is largely independent of that of the rest of India, and promises to lead to useful results.

Concluding Remarks.

37. The Meteorological Department owes a large part of its usefulness to the sympathetic assistance it receives from outside departments. Civil Surgeons and other officers of the Medical Department, as unpaid superintendents of observatories and in other capacities, help in the daily record of meteorological work; the Telegraph and Postal Departments assist in every way in the rapid transmission of meteorological information, at the same time that they allow their employees to act as observers. The Eastern Telegraph Department, by transmitting the daily Aden message free, and the Indo-Europen Telegraph Company by giving free transit to the daily records of the Persian observatories, place a large volume of most valuable information at the disposal of the Meteorological Department.

Weekly telegrams were received from the 1st May to the 15th October from the Director of the Royal Alfred Observatory, Mauritius, as well as from the departmental observatories at Zanzibar and Seychelles. These telegrams gave valuable information of the weather conditions in the Indian Ocean and the Department is indebted to the officers indicated for the punctual transmission of the information. Thanks are more specially due to the Director of the Royal Alfred Observatory for his courtesy in placing the meteorological data of that observatory at the disposal of the Indian Meteorological Department.

The Department is greatly indebted for important information as to meteorological conditions prevailing antecedent to and during the southwest monsoon, to the Director of the Government Observatory, Durban; the Director, Agriculture and Forestry Department, Zomba, British Central Africa; the Meteorologist, Dar-es-Salaam; His Majesty's Commissioner, Entebbe, Uganda; the Director, Physical Services, Survey Department, Cairo; the Commonwealth Meteorologist, Melbourne; the Directors of the Observatories at Buenos Ayres and Santiago; and to the various officers around the Indian frontiers who have collected and supplied valuable snowfall information.

The central office of the Meteorological Department at Simla was under the charge of Dr. Walker throughout the year under review and the general administration of the Department was in his hands, while the local officers who have helped very materially with the current work of the Department were as follows:—Calcutta, Mr. C. W. Peake and Dr. E. P. Harrison; Madras, Mr. R. Ll. Jones, Mr. A. Littlehailes and Mr. J L. Simonson; Bombay, Mr. G. W. Talbot; and Allahabad, Dr. E. G. Hill and Mr. A. P. Sircar.

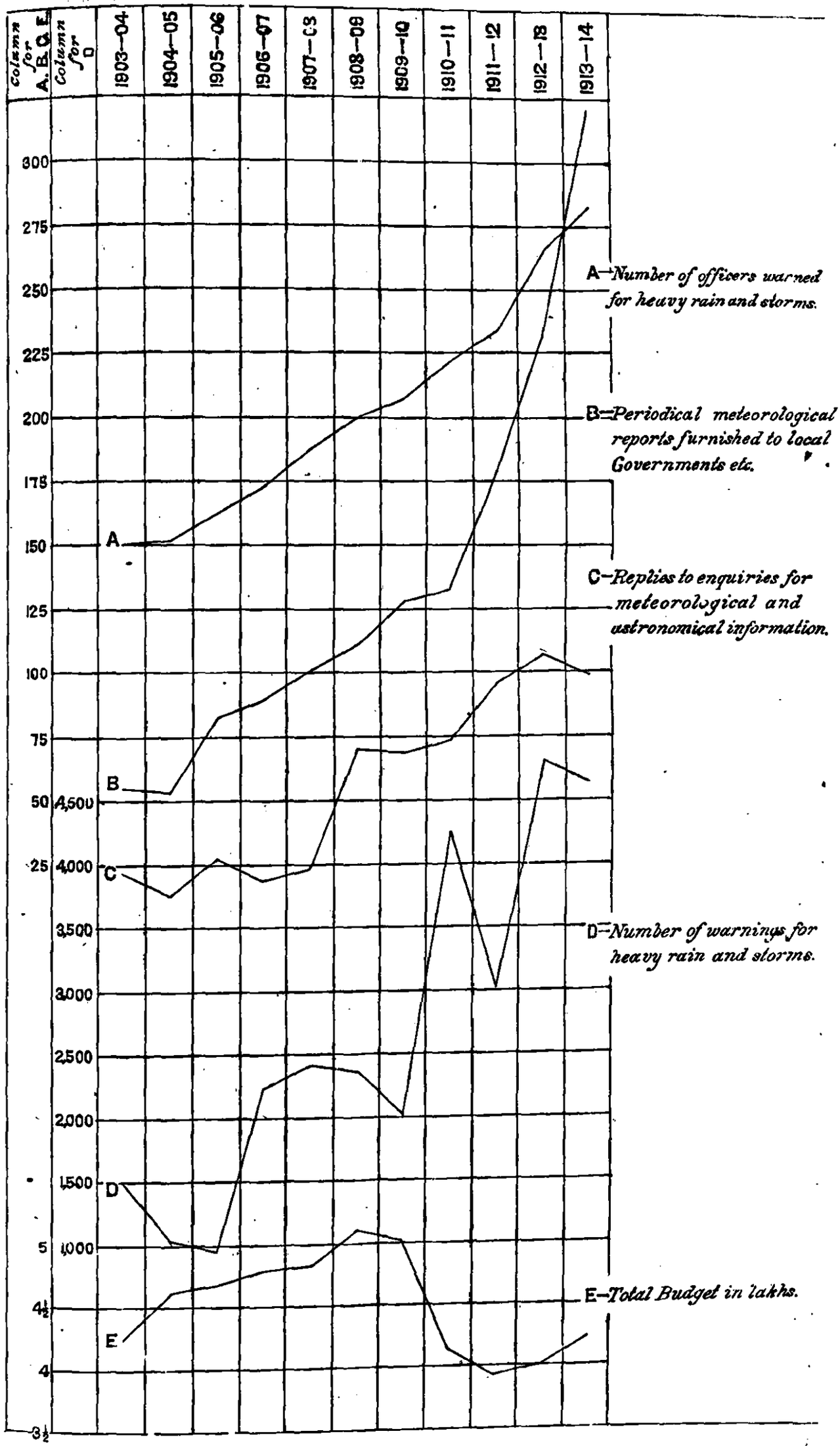
GILBERT T. WALKER,

Director-General of Observatories.

Simla, the 15th September 1914.

198MRGI—290—1-10-14—GCBP Simla

DIAGRAM SHOWING GROWTH IN DEPARTMENTAL ACTIVITY AND CHANGES IN TOTAL COST



(6)

REPORT ON THE ADMINISTRATION OF THE METEOROLOGICAL DEPARTMENT OF THE GOVERNMENT OF INDIA IN 1914-15.

CHANGES IN THE STAFF DURING THE YEAR.

Dr. Gilbert T. Walker proceeded on eight months' combined leave on 18th March 1915 and Dr. G. C. Simpson was appointed to officiate for him.

Dr. G. C. Simpson was on combined leave from 20th July to 21st October 1914. Mr. Bion acted.

Mr. J. H. Field was on privilege leave from 25th September to 24th October 1914. Mr. W. A. Harwood acted.

Mr. W. A. Harwood was on privilege leave from 16th March to 2nd May 1915.

Rai Bahadur Hem Raj was on privilege leave from 19th June to 18th July 1914. Mr. Bion acted.

Mr. C. W. Peake was on deputation at Simla from 1st July to 30th October 1914 to make a systematic study of storm warning methods. Dr. Harrison acted as Meteorologist, Calcutta.

Dr. T. Royds was on privilege leave from 29th November 1914 to 28th February 1915 combined with Special leave from 1st March to 29th May 1915. Mr. S. Sitaram Aiyar acted.

Dr. N. A. F. Moos was on privilege leave from 31st January to 30th April 1915. Mr. Mukandrai Virshunker Unaker acted.

Mr. G. W. Talbot proceeded on one year's combined leave from 7th November 1914. Mr. W. P. Henderson acted up to 30th April 1915.

OBSERVATORIES.

2. The observatories maintained by the Government of India are classified as follows :—

First Class.—Observatories which are furnished with autographic instruments for continuously recording pressure, temperature, humidity, and wind direction and velocity, in addition to instruments read by eye.

Second Class.—Observatories at which readings are taken daily at 8 hrs., 10 hrs., and 16 hrs.: those at 8 hrs. are (with a few exceptions) transmitted by telegram to one or more of the offices at Simla, Calcutta, Bombay and Madras for inclusion in the India or Provincial Daily Weather Reports.

Third Class.—Observatories—

(*a*) where readings are taken daily at 8 hrs. only; at those stations where there are telegraph offices the observations are transmitted by telegram for inclusion in the Simla, Calcutta, Bombay or Madras Daily Weather Reports;

(*b*) at stations where there are no telegraph offices, and observations are recorded at 10 hrs. and 16 hrs. only; these are included in the Monthly Weather Reviews, and furnish a series of observations for the determination of monthly and daily means which should be comparable with the means already obtained for second class observatories.

Fourth Class.—Observatories at which observations of temperature, wind and rainfall only, or of temperature and rainfall only are recorded.

Fifth Class.—Observatories which telegraph rainfall only.

3. At the end of the year the total number of observatories was 279 of which 42 were non-departmental and 237 were maintained by the Government of India. Of the 237 departmental observatories, 6 were first class, 3 second class, 184 third class, 22 fourth class, and 22 fifth class.

4. The changes in the observatories during the year were the following:—the first class observatory at Allahabad was reduced to third class on the 9th September 1914; and the fourth class observatory at Srimangal was raised to third class on 20th May 1914. A third class observatory was opened at Hissar on 22nd May 1914, and a fifth class observatory was opened at Harnai on 24th April 1914. The third class observatories at Sirsa, Diego Garcia, and Bahrien were closed on 28th May 1914, 17th July 1914 and 1st January 1915 respectively. The fourth class observatories at Ahwaz, Koweit, Maidan Minaftun, Kermanshah, and Muhammerah were closed on 1st April 1915.

First Class Observatories.

5. The Directors of the Observatories of Kodaikanal, Madras and Bombay publish separate annual reports which are forwarded for the information of Government. It has accordingly been ruled as unnecessary to include information relating to the working of these observatories in this Administration Report.

6. At Alipore (Calcutta), Allahabad and Lahore the following special instruments were in use during the year:—

Alipore.	Allahabad.	Lahore.
Bergholz barograph.	Beckley anemograph.	Draper barograph.
Kew barograph.	Richard barograph.	Richard barograph.
Dines micro barograph.	Richard thermograph.	Casella rain-gauge.
Kew thermograph.	Stokes sunshine recorder.	Beckley anemograph.
Richard thermograph.	Solar radiation thermometer.	Sunshine recorder.
Beckley anemograph.	Grass thermometer.	Grass thermometer.
Dines' pressure tube anemometer.	Ground thermometer.	Nephoscope.
Beckley rain-gauge.	Nephoscope.	Ground thermometer.
Monthly rain-gauge.	Lawrence and Mayo self-recording rain-gauge.	
Hellman Fuess rain-gauge.		
Omori-Ewing seismograph.		
Grass thermometer.		
Ground thermometer.		
Nephoscope.		

7. *The Alipore Observatory.*—This observatory is under the charge of the Meteorologist, Calcutta.

The autographic instruments have on the whole worked satisfactorily during the past year. A Dines' micro barograph was brought into use from 9th February 1915, and the Milne seismograph was changed for an Omori Ewing seismograph in March 1915.

All instruments issued by the Meteorological Department are tested at this observatory and their corrections ascertained before they are sent out for use. The number of instruments tested and verified during the year was 804 as compared with 768 last year. 35 instruments were condemned as unfit for issue, or were sent to the India Office for repair and 6 instruments were kept in store for future treatment. In addition to the above, 244 instruments were examined and issued to other observatories.

The observatory gives mean Calcutta time to the port and shipping. Three time balls are dropped daily at 1 P.M., local meantime throughout the year, one on the Semaphore Tower at Fort William, the second at the Port Commissioners' office and the third at the Kidderpore Docks. This work was carried out quite satisfactorily as far as this department is concerned. There were 24 failures as compared with 15, the average number of the past 25 years; but in

all cases they were due to defects in the electric or mechanical arrangements outside the observatory, for which this department is not responsible.

Year.	Number of days on which one or other ball failed to drop properly.	Number of failures due to telegraphic defects
1914-1915	24	24
1913-1914	36	36
1912-1913	50	50
1911-1912	21	21
1910-1911	21	20

8. *The Allahabad Observatory.*—This observatory which was under the charge of the Meteorologist Allahabad, was reduced to the status of third class from 9th September 1914, from which date the use of the following instruments (except the nephoscope) was discontinued.

Beckley anemograph.—This instrument worked fairly well while in use, the breaks being due to indistinct tracings and the instrument being out of order.

Richard barograph.—This instrument gave excellent tracings while in use.

Richard thermograph.—The dry bulb tracings with a few exceptions have been good.

Sunshine recorder.—Good results were recorded.

Nephoscope.—Regular observations were made with the Duboscq instrument.

Readings of all the eye instruments were taken every two hours from 8 hours to 18 hours. In addition to the ordinary observations, special observations of cloud for use at the Aerological Observatory at Agra were taken.

9. *The Lahore Observatory.*—Eye observations of the ordinary meteorological instruments were taken seven times daily at this observatory as in past years at 6, 8, 10, 14, 16, 18, and 22 hours. Ground surface temperature was recorded four times daily at 6, 10, 16, and 22 hours.

Character of the work of Observation at second and third class observatories.

10. The general character of the work of the observatories, as judged by the number of mistakes made by observers was satisfactory.

The number of stations of great reliability, in which either no mistake or only one mistake has been detected in the data for the Indian Daily Weather Report, was 21 as against 39 in 1913-14; while, the number of stations at which more than 50 mistakes were made was 5 as against 11 last year.

The usual list showing the number of mistakes in observation and in the preparation of telegrams for all the observatories which send weather telegrams to the Simla office was prepared and circulated to the observatories on the 20th August 1915.

Inspection of Observatories.

11. The number of visits paid to observatories during the year under review was 76 as compared with 69 in the previous year and an average of 60 during the past 10 years.

The Director-General inspected the observatories at Calcutta, Bombay, Alibag, Madras, Kodaikanal, Allahabad, Rangoon and Bangalore. Mr. Normand inspected 16; Mr. Hem Raj inspected 17; Mr. Bion 7; Mr. Gaetane 27 and Mr. V. Daraiswamy Iyer 1.

Of the 69 second or third class observatories that were visited 52 were reported as good, 14 as tolerable and 3 as bad.

Condition.	Second or third class observatories inspected in					
	1914-15.	1913-14.	1912-13.	1911-12.	1910-11.	1909-10.
Good or satisfactory	52	34	31	20	23	25
Tolerable	14	23	17	16	31	11
Bad	3	6	3	1	3	4
Total ..	69	63	51	37	57	40

In estimating the general character of the observatories from the above table it must be remembered that it is, as a rule, on account of something unsatisfactory that a visit of inspection is made. The general level of the stations is thus decidedly better than might otherwise appear. The most frequent cause of bad work is the changing of observers at short intervals necessitated by acting and other arrangements in the Medical, Telegraphic and Postal Departments.

Special observations.

12. Observations other than those recorded by local observers at regular intervals are made as follows :—

(*a*) In accordance with orders issued from the Simla or Calcutta office, when weather is disturbed and storm warnings may have to be issued: such observations are sent by telegraph. Certain observers at coast observatories are in receipt of a regular monthly allowance of Rs. 5 for sending special storm warning telegrams, while other observers receive an allowance of Re. 1 for each set of special observations sent under instructions from either Simla or Calcutta. The number of telegrams of the latter class forwarded during the year under review was 401 as compared with 529 despatched the previous year.

(*b*) Certain observers, when they consider that conditions at sea are sufficiently threatening, send of their own initiative to Simla or Calcutta a telegram containing special observations. Nine such telegrams were received.

(*c*) In connection with flood warning a number of observers have been instructed to send the telegrams announcing the occurrence of heavy rainfall to Government officers and railway engineers who desire early information. The number of telegrams so sent was 207 as compared with 126 last year.

(*d*) Observers are instructed to send detailed information of earthquakes to the Simla Meteorological Office and to the Director, Geological Survey, Calcutta; for this work they are paid awards from this department. Of such reports 104 were received during the year.

Observations with special Meteorological Instruments.

13. The following special observations were carried out during the past year at certain selected stations :—

1st—Wind observations recorded by Beckley anemographs at 8 stations, and by Dines' pressure tube anemometers at 4 stations.

2nd—Solar and terrestrial radiation observations at 2 and 9 stations, respectively.

3rd—Underground temperature observations at 2 stations.

4th—Sunshine observations at 6 stations.

5th—Barometric observations recorded by self-registering instruments, chiefly Richard barographs at 18 stations.

6th—Temperature observations recorded by self-registering instruments, chiefly Richard thermographs, at 10 stations.

Observations of solar energy in absolute units.

14. Observations were continued at Simla throughout the year, when weather conditions allowed, by means of Angstrom's electric pyrheliometer.

Observations in the Upper Air.

15. Until the beginning of July 1914, by which time the new observatory buildings in Agra were sufficiently near completion to be occupied, work was continued at the temporary quarters secured last year. The new buildings were occupied at the beginning of July and work was begun on their equipment. By the end of the year the internal arrangements were nearly ready for full activity.

Pilot balloons were sent up during the year at Agra and Simla, and cloud observations and measurements were made three times daily at several stations in India. In April 1914 a new pilot balloon station was started at Kojak (Chaman), and special short series of balloon observations were made at Darjiling from April to June and at Allahabad in May and June.

The major portion of the year 1914-15 was thus occupied with experimental work and preparations for its extension, but some progress was made in the analysis of balloon and cloud observations. The results in India of balloon flights were supplied to Dr. Fillippi over the period covered by his similar work in the Himalayas; and a discussion of cloud observations made by the Survey Department in the Pamirs was contributed to their report of a journey in that region.

Researches by the Simla Staff.

16. Owing to the transfer of the laboratory and mechanics from Simla to Agra the opportunities for experimental research in Simla have become very greatly reduced and no experimental work is at present being undertaken in Simla. Research work of a statistical nature, however, continues and during the year a long investigation with the object of correlating weather in all parts of the world with solar activity as exhibited by sunspots has been successfully completed. The results are published in the Memoirs of the Department.

It was mentioned in last year's report that the problem of forecasting the local distribution of monsoon rainfall was being undertaken. This work necessitates the preparation of large masses of statistics and their mathematical investigation. Satisfactory progress has been made, but the investigation is not yet completed.

Seismograph Observations.

17. Seismological observations were recorded throughout the year by two Omori-Ewing seismographs at Simla and one at Bombay; by Milne seismographs at Alipore (Calcutta), Kodaikanal and Colaba (Bombay); and by means of other self-registering instruments at the last-named station. The Milne seismograph at Alipore was dismantled on 20th December 1914 and one by Omori-Ewing was brought into use on 17th March 1915. All the instruments worked satisfactorily throughout the year, and copies of the records of the Milne seismographs were transmitted to the Seismological Committee of the British Association.

Marine Meteorology.

18. No change was made during the year under review in the method of collecting marine information.

At Calcutta and Bombay a clerk at each port spends his whole time in visiting ships, making in each case a copy of the log and a comparison of the ship's barometer with a secondary standard, for the purpose of applying the necessary corrections to the readings in the logs; and, after the barometer comparisons have been made a statement of the error of the ship's barometer is given to the captain, in case he should desire to make use of it. The number of ships visited is materially less than that of the vessels which come into port, but it is ample for the purposes of the department.

The data thus obtained are utilised in the preparation of charts of disturbances in the Bay of Bengal and the Arabian Sea for future reference in connection with the storm warning work of the department, and in drawing up an account of the storms of the year for publication in the Annual Summary.

The arrangements made with the London Meteorological Office, and the Royal Alfred Observatory at Mauritius, for collecting marine data from the whole of the Indian Ocean, have

been continued and the thanks of this department are again due to these offices for thus supplying a large amount of useful data.

Observations recorded during the year at the entrance of the River Hughli were supplied to the Meteorological Department by the light-vessel "Luna."

Snowfall Registration in the Mountain Districts to the North and West of India.

19. The information as to the amount, distribution and time of occurrence of the snowfall in the Himalayan and Afghan mountain areas was on the whole tolerably complete, and the thanks of the department are again due to the various officers who have collected and forwarded it. Additions to the information received have been obtained by continuing the series of large-scale photographs of the snows, as seen from Simla, which was started in 1905.

Rainfall Registration.

20. The registration of rainfall in India has invariably been carried out by the provincial authorities. In 1889 a uniform system was introduced by the Government of India, and the Director-General of Observatories was made consulting officer in connection with this work. His advice is sought regarding the starting of new rain-gauge stations, and he receives annual reports from the local officers responsible for the registration of rainfall upon the efficiency of the work. A general account of the system, which came into operation in the year 1891-92, will be found on pages 5-8 of the Administration Report of the year 1889-90, and on pages 6 and 7 of the Administration Report for the year 1890-91.

The following is a statement of the number of rain-gauge stations from which data were being received for publication in the Rainfall Data of India at the end of the year under review :—

Province or Division.	Number of rain-gauges supplying returns for publication on 31st March 1915.	Province or Division.	Number of rain-gauges supplying returns for publication on 31st March 1915.
Burma	211	Baluchistan	93
Assam	124	Rajputana	186
Bengal	223	Bombay and Sind	289
Bihar and Orissa	294	Central India	117
United Provinces	276	Central Provinces	178
Punjab	189	Hyderabad	18
Kashmir	37	Mysore	77
North-West Frontier Province ..	33	Madras (including Pudukkottai, Coorg, Travancore and Cochin).	506

The following paragraphs give a brief summary of the reports of the officers in charge of rainfall registration for the year 1914-15 :—

Assam.—The total number of rainfall stations was 124 against 125 in the preceding year. The number of gauges inspected was 92, or one more than the previous year, the total number of inspections being 167 against 133 the previous year. In Cachar more than half the gauges remained without inspection owing to the resettlement of the district. Inspections of 57 rain-gauges were made more than once.

Baluchistan.—There were at the close of the year 92 rain-gauges : of these 45 were maintained by the railway department at railway stations, while 38 (excluding those attached to departmental observatories) were under the civil and irrigation departments.

No mention is made by the Revenue Commissioner in Baluchistan of the number of rain-gauges inspected, it being only remarked that no special points were brought out by the inspection of gauges.

Bihar and Orissa.—The total number of rain registering stations amounted to 294 (including 26 stations situated in the Orissa Feudatory States and Orissa Tributary Mahals) against 282 last year. Inspections of 155 stations were made and 99 inspection cards were received against 150 and 111 respectively last year. The rain-gauges were, on the whole, in good condition, and the work of registration was done satisfactorily.

Bengal.—There were 224 rainfall stations in the Province or one less than last year. Of these, only 32 were inspected as against 48, 60, and 108 during each of the preceding years. These figures show that there has been a steady slackening in the work of inspection in Bengal and the matter has been brought to the notice of the Director of Agriculture, Bengal, under whose supervision the work is done.

Bombay and Sind.—There were 278 rain-gauges in British districts against 276 in the previous year, of which 207 were inspected as compared with 213 last year. The total number of inspections amounted to 324 against 355 last year and 87 gauges were inspected more than once. There was some improvement with respect to the work in Native States, in that 46 gauges (out of 61) were inspected as compared with 38 inspected the previous year, four gauges being inspected more than once.

Burma.—There were 211 rain recording stations as against 200 the previous year: of these 19 were meteorological observatories and 26 in charge of the Public Works Department. Inspections of 140 rain-gauges were made, or a decrease of 16 as compared with last year. Of these 106 were reported in good, 28 in a fair, and 6 in a bad state.

Central Provinces.—The number of rain-gauges maintained during the year was 118 against 112 in the previous year. The number of inspections of which reports were received was 130 against 121 in the preceding year. The results obtained during the year were generally satisfactory.

Hyderabad.—The rainfall registering stations of Hyderabad are in charge of the Nizam's Public Works Department. There are 16 such stations, all of which have been inspected and 8 have been visited more than once. In addition, there is a rain-gauge at the Residency Hospital in charge of the Residency Surgeon.

Kashmir.—There were 36 rain-gauges in this State, of which 8 are meteorological observatories and the remainder are in charge of the Revenue Department. Only two gauges were inspected owing to epidemic diseases which prevailed in the State.

Madras.—There were 477 rain recording stations at the close of the year under review, of which 394 were in the Madras Presidency: in the preceding year the corresponding figures were 475 and 391. The number of stations inspected was 388 as against 377 inspected the previous year.

Mysore.—At the close of the calendar year 1914 the number of rain recording stations was 225 as against 223 in the previous year. Out of these, 194 or 86 per cent. were inspected as against 87 per cent. during the previous year.

North-West Frontier Province.—The report on rainfall registration contained in the current administration report of this province refers to the year 1913-14 and states that the rain-gauges were in good order and the rainfall registers well kept. Two new rain-gauges were established in the Dera Ismail Khan District, one at Miran and the other at Chandhwan.

Punjab.—The number of rain-gauges in the Punjab during the calendar year 1914 was 231 or 9 more than last year. Of these, 153 were in charge of district officers and 78 under canal officers. There were 55 inspections during the year as against 51 last year. The rain-gauges under both district and canal officers are reported to be in good order and the records well kept up.

United Provinces.—There were 288 rain reporting stations in these provinces including the meteorological observatories. Out of 274 stations under the supervision of district and canal officers, 58 per cent. were inspected during the year.

Summary.—In the Central Provinces, Hyderabad, Madras, and Mysore over 75 per cent. of the rainfall stations were inspected; in Assam, Bihar, Bombay, Burma, and the United Provinces over 50 per cent.; Bengal 14 per cent.; Kashmir 5 per cent.; and the Punjab 23 per cent.

The System for Storm Warning.

21. The work of warning Indian ports of the approach of cyclonic storms or of bad weather is performed from the Simla Office by the Director-General of Observatories, and from the Calcutta office by the Meteorologist, Calcutta.

The following ports are warned from Simla for storms in the Arabian Sea:—

Aden, Karachi, Cutch Mandvi, Jamnagar, Dwarka, Porbandar, Veraval, Jafarabad, Bhavnagar, Daman, Bombay, Alibagh, Murud Janjira, Harnai, Ratnagiri, Malvan, Vengurla, Nova Goa, Marmagao, Karwar, Kumta, Honavar, Mangalore, Tellicherry, Calicut, Cochin, Alleppy and Colombo.

The Meteorologist, Calcutta, warns the following ports for storms in the Bay of Bengal:—

Colombo, Tuticorin, Pamban, Nagapatam, Cuddalore, Madras, Masulipatam, Cocanada, Vizagapatam, Calingapatam, Gopalpur, Puri, Hukitala (False Point), Chandbali, Balasore,

Saugor Island, Diamond Harbour, Mud Point, Budge Budge, Calcutta, Morelganj Barisal, Goalundo, Narayanganj, Noakhali, Chittagong, Cox's Bazar, Akyab, Kyaukpyu, Diamond Island, Bassein, Rangoon, Moulmein, Tavoy, Mergui, Table Island and Port Blair.

The following River Police stations in Eastern Bengal and Sunderbans have been added :—

Markholi, Mudna, Nikli, Bhairab, Jaikalipur, Dandkandi, Narayanganj, Goalundo, Lohajang, Chandpur, Elashin, Patuakhali, Hargilarchar, Sirajganj, Jhalakati, and Pirojpur.

22. In addition to special messages sent during stormy weather the Meteorologist, Calcutta, provides shipping during a large part of the year with daily information regarding the weather over the Bay. This information is made available at the following places by means of daily weather telegrams to an officer at the Port or by the hoisting of flag signals :—

Negapatam, Porto Novo, Cuddalore, Madras, Cocanada, Vizagapatam, Calingapatam, Gopalpur, Saugor Island, Chittagong, Akyab, Elephant Point, Rangoon, and Moulmein. Information to Kalagauk and Sabang was discontinued during the year.

23. In accordance with resolutions passed at the International Radio-Telegraph Conference held in London in June and July 1912, the Indian radio-telegraph coast stations are now supplied with telegrams containing meteorological information with regard to the Arabian Sea and the Bay of Bengal for transmission to ships which ask for them. These messages are sent to the radio stations at Bombay, Karachi, Sandheads, Diamond Island, Table Island and Victoria Point. The messages to the Calcutta radio station were discontinued in January 1915.

Arrangements made for the receipt by wireless telegraphy of meteorological observations from ships at sea worked satisfactorily up to August, when owing to the outbreak of the war these wireless telegrams had to be discontinued.

Warnings for Storms in the Bay of Bengal.

24. During the year warnings were issued for thirteen disturbances. Four of these developed into storms of some severity and were of sufficient importance for a statement to be given here of their course and of the action taken.

(1) A depression formed to the west of the Andamans on the 12th May. It developed during the next two days into a storm of considerable intensity, and travelling in a north-westerly direction crossed the coast just south of Gopalpur on the night of the 15th.

The Bay ports that were likely to be affected or from which ships might run into the storm were informed daily from the 12th. On the 14th the Orissa and north Madras coast ports were warned of the approach of the storm and suitable signals were hoisted. The action taken with regard to Gopalpur is shown by the following telegrams :—

Gopalpur.

14th May 1914 at 11 hrs. 55 mins. "Hoist danger signal number three.* A severe cyclonic storm is advancing towards north Circars or Orissa coast."

15th May 1914 at 11 hrs. 16 mins. "Storm probably very severe about one hundred miles south-east of Gopalpur approaching that port; take precautions."

16th May 1914 at 11 hrs. "Lower storm signal; storm passed inland near Gopalpur last night, now moving north or north east."

The storm at first appeared to be travelling north or north-east, and only the ports on the east of the Bay were warned until the 14th, when it was ascertained that the storm was moving in a north-westerly direction.

(2) On the 31st May a storm was shown forming over the north of the Bay. It developed into a severe disturbance, and may even have been a true cyclone with a calm centre. On the 2nd it was in Lat. 18½°, Long. 89°, and then travelled in an east-north-easterly direction (an unusual course for a storm in May or June) and crossed the coast to the south of Akyab on the evening of the 3rd.

On the 31st ports on the south Orissa and north Madras coasts were warned that a storm was forming off the north Circars coast, and on the 1st all ports west of Noakhali were told that the storm was moving north or north-east. On the early

* Indicating that a cyclonic storm, probably of slight to moderate intensity, is affecting the port, and that its centre will probably cross the coast over or near to the port.

morning of the 3rd when it was definitely ascertained that the storm was travelling in an easterly direction the ports on the southeast Bengal and Arakan coasts were informed that the storm was approaching the Arakan coast near Akyab. The action taken with regard to Akyab is shown by the following telegrams :—

AKYAB.

3rd June 1914 at 5 hrs. 26 mins. "Hoist warning signal.* Storm from Bay approaching the Arakan coast near Akyab."

3rd June 1914 at 10 hrs. 27 mins. "Hoist great danger signal number three.† Storm in the Bay has become a severe cyclone and is advancing towards Akyab. Take all precautions in port."

3rd June 1914 at 18 hrs. "Lower storm signal. Storm crossed coast near Akyab."

(3) A depression formed over the Andaman Sea on the 1st October, travelled north-westwards on the 2nd and 3rd, and then changing its course to north and north-east crossed the coast midway between Chittagong and Akyab on the 6th. It was a disturbance of moderate intensity.

The Andamans and the ports on the neighbouring Burma coast were informed of the existence of the storm on the 2nd, and warnings were extended on 3rd to the Arakan coast. On the 5th intimation of the approach of the storm was sent to Chittagong and the other ports on the east Bengal coast.

The action taken with regard to Akyab and Chittagong is shown by the following telegrams :—

AKYAB.

3rd October 1914 at 11 hrs. 10 mins. "Depression exists west of Andamans expected to develop into storm."

4th October 1914 at 11 hrs. 55 mins. "Hoist warning signal. Depression become storm about one hundred fifty miles west Diamond Island may move north-east affecting Akyab."

5th October 1914 at 10 hrs. 5 mins. "Lower warning signal and hoist danger signal number three. Storm intensified appears to be moving towards coast near Akyab. Take precautions."

5th October 1914 at 15 hrs. 40 mins. "Storm moving north unlikely to affect you further."

6th October 1914 at 11 hrs. 2 mins. "Lower storm signal. Storm reduced intensity now south of Noakhali moving north."

6th October 1914 at 23 hrs. 13 mins. "Storm passed inland and filled up."

CHITTAGONG.

5th October 1914 at 11 hrs. 2 mins. "Hoist warning signal. Storm exists considerable distance south-west Kyaukpyu moving northerly direction."

6th October 1914 at 10 hrs. 52 mins. "Lower warning signal and hoist danger signal number three. Storm reduced intensity now south of Noakhali moving north."

6th October 1914 at 22 hrs. 25 mins. "Lower storm signal. Storm passed inland and filled up."

(4) Weather was disturbed over the south of the Bay on the 16th and 17th December and by the morning of the 18th these disturbed conditions had developed into a storm situated about 100 miles to the east of Trincomalee. Its position on the morning of the 20th was about Long. 84½° and Lat. 12¼°, and from this position it followed a north-easterly course till it crossed the coast close to Akyab on the night of the 21st-22nd. The storm was one of considerable intensity.

The Andamans and the ports on the Coromandel coast were informed on the 18th of the formation of a disturbance which might move towards the Madras coast. As the storm appeared to be changing its course to north warnings were extended on the 19th to Masulipatam and Cocanada, on the 20th to Vizagapatam, Calingapatam, Gopalpur, Puri and Hukitala, and on the 21st to the ports between Chandbali

*Indicating that a cyclonic storm has formed, which will probably advance to that part of the coast on which the port is situated, but is still at a considerable distance from it.

†Indicating that a cyclonic storm of great intensity is affecting the port, and that its centre will probably cross the coast over or near to the port.

and Kyaukpyu. The evidence afforded by the observations was so conflicting that it was not till the afternoon of the 21st that the ports concerned could be told definitely that the storm was advancing towards the Chittagong coast.

The following telegrams show the action taken with regard to the ports of Chittagong and Akyab :—

CHITTAGONG.

21st December 1914 at 12 hrs. 6 mins. "Hoist warning signal. Storm in Bay there is possibility of reaching you within twenty-four hours cannot say definitely yet but will wire again."

21st December 1914 at 15 hrs. 43 mins. "Hoist great danger signal number three storm curving eastwards will strike coast to-night probably between Saugor Island and Akyab."

21st December 1914 at 19 hrs. 29 mins. "Storm moving towards Chittagong will cross coast to-night. Intensity probably decreasing."

22nd December 1914 at 6 hrs. 42 mins. "Lower storm signal. Storm has crossed coast between Cox's Bazar and Akyab."

AKYAB.

21st December 1914 at 15 hrs. 43 mins. "Hoist great danger signal number three. Storm curving eastwards will strike coast to-night probably between Saugor Island and Akyab."

21st December 1914 at 19 hrs. 29 mins. "Storm moving towards Chittagong will cross coast to-night. Intensity probably decreasing."

22nd December 1914 at 6 hrs. 42 mins. "Lower storm signal. Storm has crossed coast between Cox's Bazar and Akyab."

WARNING FOR STORMS IN THE ARABIAN SEA DURING THE YEAR.

25. The Simla office warns the west coast ports, not only for storms, but also for squally weather, especially at the beginning of the monsoon. There were eleven periods of disturbed weather in the Arabian Sea, for which warnings were issued, but none of these disturbances developed into a storm.

FLOOD WARNINGS AND WEATHER FORECASTS TO DISTRICT, IRRIGATION, RAILWAY AND OTHER OFFICERS.

26. This work is carried out chiefly by the Simla Meteorological Office, and partly by that of Calcutta. The arrangements have been made at various times, and differ considerably in character, according to the nature and extent of the flood or weather warnings required by the officers concerned. In most cases these officers require telegrams warning them of advancing storms likely to give heavy rain, or of actual heavy rainfall, likely to give rise to severe floods which might injure railways or canal works; and in others they require warnings or forecasts of the weather for as long a period beforehand as possible, so as to enable them to modify their arrangements for carrying on the works under their charge so far as may be necessitated by sudden or large changes of weather.

The number of district officers and officers in the irrigation, telegraph, railway and other departments requiring warnings from Simla amounted at the end of the year to 146, an increase of 14 during the year.

This number does not include captains of mail steamers and other vessels who occasionally telegraph from Karachi, Aden and other ports for the latest intelligence respecting the position and movement of cyclonic storms, nor does it include the names of other individuals or firms who ask for special forecasts.

27. The number of warning messages sent from Simla during the year 1914-15 was 2,060 as compared with 1,840 in 1913-14 and 1826 in 1912-13. The number for 1914-15 includes 203 daily messages sent to the Director of Marine, Bombay, regarding atmospherics in the Arabian Sea.

The number of warnings for heavy rainfall sent from Calcutta during the year 1914-15 was 1,003 as compared with 863* in 1913-14.

* The number given in last year's "Administration Report" was not correct.

28. Instructions were issued by the Government of India in 1898 that every officer to whom storm or flood warnings are issued, should in the month of January of each year or, in the case of military expeditions, at the close of the campaign, forward to the head of this department a brief return of the warnings received during the past year, and should also report :—

(1) Whether the warning telegrams were rapidly transmitted and delivered by the Telegraph Department.

(2) Whether the warnings were timely and satisfactory in every respect and, if not, in what points they were defective.

(3) Whether any changes might be made in the system which would make the warnings more useful.

Reports on the ordinary storm and flood warnings for the calender year 1914 were received from 52 officers. Of these 35 stated that the warnings were satisfactory; 13 offered no remarks, and 3 reported that they had received no warnings during the year, while one stated that a warning had been received too late to enable him to take full precautions.

The following extracts from letters received may be of interest :—

From the Superintending Engineer, Public Works Department, Bengal, South-Western Circle. " I should like to take this opportunity of expressing my obligation to the Meteorological Department for the help they have extended to this Department during the flood season of 1914, more especially in connection with the new system of flood warnings introduced for the first time during that year in connection with the Damodar floods. The telegrams received from specially selected rainfall stations in Chota Nagpore were of great assistance. They were despatched and received promptly and enabled the warnings of floods to reach the officers in charge of the embankments well in advance of the floods. Since everything worked so well I am unable to suggest any modifications and I hope the same system will be continued this year."

From the Director of the Royal Indian Marine, " Telegrams regarding atmospherics are no longer necessary now that the situation in these waters has eased. These telegrams have been of great assistance to me in connection with Wireless Telegraph operations."

From the Executive Engineer, Terai and Bhaber Government Estates Division. " The construction of the arch for which the information was required has been finished, and owing to the notice we have had of sudden freshets from the Kumaon hills the difficulties were considerably reduced."

From the India General Navigation and Railway Company, Limited. " Our Narainganj Agent has forwarded us copies of your telegrapic warnings regarding the movements of the recent cyclonic storm. These have been of the greatest assistance to us in the protection of our numerous vessels plying within the disturbed area and we beg to tender our thanks for the very complete record of the movements of the disturbance communicated to our various Agencies."

A comparison of the reports of floods and of heavy rain with information supplied to the various officers would appear to show that the system is working satisfactorily, and that most of the warnings issued were timely and of use to the recipients. No suggestions were put forward by the officers concerned for changes or improvements in the flood warning service.

Seasonal Forecasts.

29. The forecast for the monsoon period of 1914 dated the 8th June, was sent to Local Governments and Administrations, communicated to the press, and printed in the Gazette. A statement of the rainfall of June and July with a forecast for August and September was drawn up on the 8th August 1914 and published in a similar manner.

A statement of the actual rainfall during the monsoon period and a comparison of the two forecasts with actual rainfall was drawn up on the 4th January 1915, and sent to Local Governments and Administrations.

The following are summaries of these two forecasts, and a comparison of them with the actual rainfall:—

Forecast dated 8th June 1914.	Remarks.
(*a*) The indications are conflicting, but it appears on the whole likely that the total monsoon rainfall of India will be somewhat less abundant than usual, at any rate in the earlier part of the season.	The monsoon rainfall of India was less than usual in June, for the total rainfall of that month which was almost exactly normal, included an unusually large quantity of rain in the extreme north brought by depressions of the cold weather type entering India through Afghanistan or Western Turkistan. In August also the rains were less abundant than usual, but in July and September there was an excess, and the total rainfall of the season was in excess by 3·4 inches or 10 per cent.
(*b*) There are indications of unsteadiness, so that periods of abundant as well as of scanty rainfall are to be expected.	The monsoon was abnormally unsteady in June, August and September.
(*c*) Regarding the geographical distribution of rainfall it seems that while local conditions are favourable for the Malabar coast they are somewhat unfavourable for the Punjab and United Provinces, and, to a very slight extent, for Rajputana and Central India. These indications regarding distribution apply only to the first half of the monsoon period.	The total rainfall of June and July in Malabar was in excess by 3½ inches or 5 per cent., and the excess extended to the Konkan, Bombay Deccan and Hyderabad. As regards the Punjab and United Provinces, if we reckon rainfall from the 12th June, before which date the monsoon had not reached these areas, the rainfall of the Punjab was in defect until the middle of July, and that in the west of the United Provinces until August, but that in the east reached its average total early in July. The monsoon rainfall of Rajputana similarly estimated was in defect until the middle of July and that of Central India in June.

Forecast dated 8th August 1914.	Remarks.
(*a*) The indications regarding the total monsoon rainfall of August and September are decidedly conflicting. On the whole it appears probable that the rainfall will be roughly normal in amount.	The rainfall of India was in slight defect in August and in slight excess in September; the total for the two months was in excess by 0·27 inch or 2 per cent., which is practically normal.
(*b*) There are signs of greater variability than usual in the strength of the monsoon.	The monsoon was abnormally unsteady in August and September.
(*c*) There are no reasons for anticipating any marked abnormalities in the geographical distribution of rainfall.	These abnormalities occurred to about the usual extent. Rainfall was in defect in Central India and in excess in the Peninsula excluding Mysore.

The August forecast was correct in its main features, but the indications of that of June were too pessimistic regarding the rainfall of the first half of the period, especially in July. The forecast was based on the view that pressure would be unfavourable and those of June and July actually proved to be such as are usually associated with deficient monsoon rains. The partial failure of the forecast in its indications regarding the United Provinces and surrounding areas in July is thus due to some factor about which nothing is known as yet.

30. A forecast of the probable character of the rains during January and February 1915 was prepared on the 6th January 1915 and issued in the same manner as the forecast of the previous June. On the 14th July 1915 a comparison of the actual precipitation with the above forecast was issued.

The summary of the forecast issued was :—

It is probable that the amount of rainfall in north-west India and of snowfall on the neighbouring hills will be approximately normal.

The snowfall was practically normal. The rainfall was deficient in north-west India during January by ·12″ and in excess during February by ·91″ : thus over the whole period there was an excess of ·79″. The excess during February was chiefly due to disturbance in the first week which gave some unusually heavy local rain, especially in Rajputana and the United Provinces. Judged by the character of the weather and not by the total rainfall the season was not abnormal.

Daily Telegraphic Weather Summary.

31. The summary was despatched daily at about noon. It was exhibited at certain telegraph offices and sent to 102 officers of Government. The subscribers, for longer or shorter periods, were 18 newspapers and 41 private individuals.

Publications.

32. There were no changes made during the year in the routine publications of the department of which a description will be found in the departmental Administration Reports of 1907-08 and 1910-11.

The following memoirs of the Indian Meteorological Department were published during the year 1914-15 :—

" A further study of relationships with Indian Monsoon Rainfall ; " by Gilbert T. Walker, C.S.I., M.A., Sc.D., F.R.S., Director General of Observatories. (Memoirs of the Indian Meteorological Department, Volume XXI, Part VIII.)

" Correlation in seasonal variations of weather, III on the criterion for the reality of relationships or periodicities ;" by Gilbert T. Walker, C.S.I., M.A., Sc.D., F.R.S., Director General of Observatories. (Memoirs of the Indian Meteorological Department, Volume XXI, Part IX.)

" Monthly and annual normals of pressure, temperature, relative humidity, vapour tension and cloud ; " by Gilbert T. Walker, C.S.I., M.A., Sc.D., F.R.S., Director General of Observatories. (Memoirs of the Indian Meteorological Department, Volume XXII, Part III.)

" A discussion of the anemographic observations recorded at Port Blair and Dhubri ;" by W. A. Hatwood, M.Sc., Assistant Director, Aerological Observatory, Agra, with an introduction by Gilbert T. Walker, C.S.I., M.A., Sc.D., F.R.S., Director General of Observatories. (Memoirs of the Indian Meteorological Department, Volume XIX, Parts III and IV.)

Supply of Meteorological information.

33. In addition to the meteorological information published by the department special information was supplied to the Meteorological Departments of England, Australia and Egypt, and to the Solar Physics Committee, London.

Climatological information, at times involving special calculation, is also provided for sanitary and other officers of Government, as well as for private firms who are willing to pay the expense necessarily incurred. The extent to which the department is utilised in this manner is increasing steadily, as will be seen from the chart appended.

Miscellaneous.

34. Seven hundred and forty-eight books and pamphlets, either purchased or presented by scientific bodies were added to the Library during the year, as against eight hundred and seventy-seven in the previous year. The cause of the reduction is attributable to the war.

Nine libraries, observatories or societies were added during the year to the list of institutions to which the publications of the Indian Meteorological Department are supplied, and four were removed ; the number on the list is now 347.

35. At the end of the previous year arrangements had been completed for obtaining from ships at sea information by wireless telegraphy as to the meteorological conditions experienced by them. This information is of the greatest importance in fixing the intensity and position of storms before the coast stations are sufficiently affected for reliable inferences to be drawn from their observations. Unfortunately before the new scheme had been sufficiently long in use to ensure smooth working the war put an end to wireless communication, and the scheme was in abeyance during the remainder of the year under review.

The negotiations connected with the reorganisation of the system of storm warnings in the Bay of Bengal and Arabian Sea, and for distributing information to ports and shipping with regard to daily weather were continued. The opinions of those chiefly affected have been collected and discussed, and before the end of the year the final scheme was submitted to Government for approval.

The warning of ships and ports, which is one of the chief functions of the department, has also been developed on its scientific side. Mr. Peake, who during many years has gained valuable experience as the officer in charge of the Bay of Bengal storm warning service in Calcutta came to Simla on deputation from 1st July to 30th October 1914 and devoted his whole time to a study of the origin and development of the storms in the Bay. His attention was given chiefly to devising methods for fixing with greater accuracy the positions of the storms, and for determining their movement from the successive changes in the meteorological elements at the coast stations. The work, which necessitated consulting the records of previous storms, has given valuable results and a *resumé* will shortly be published in the Memoirs of the Department. It is difficult to overestimate the benefits derived from deputations of this nature. In addition to the direct results of solving difficult problems the intercourse which such investigations necessitate between the scientific officers of the department has a great stimulating effect.

It is a well-known fact that it is the unsteadiness of the atmosphere and not the power of the telescope which ultimately limits the possibility of seeing the finest details of the heavenly bodies. In 1913 Mr. Evershed, the Director of the Solar Observatory at Kodaikanal spent his privilege leave in Kashmir, and while there he was very much struck by the great homogeneity of the atmosphere which made it possible to see the surface structure of the sun and planets with extraordinary distinctness. Solar work depends so largely on the ability for seeing the finest markings of the sun's surface, that the Government of India deputed Mr. Evershed to visit Kashmir during May to July 1914 to carry out further investigations on this unexpected quality of the atmosphere over the Kashmir valley. The photographs of the sun taken on this expedition, and the careful record kept of the "seeing" at all hours of the day, have proved conclusively that so far as is known, no other place in the world can compare with Kashmir in this respect. The discovery is so important that a further expedition to Kashmir with more powerful instruments and for a longer period has been sanctioned and will take place during 1915-16.

At the time of his death, Sir John Eliot was engaged on writing a series of memoirs on the winds of India, based on the data accumulated during a large number of years from Beckley anemometers. He had already discussed the records from eleven stations and left the tabulated data for six other stations. These latter data have now been discussed by Mr. Harwood and the results published, thus completing the work commenced by Sir John Eliot.

On 9th September 1914 the observatory at Allahabad was reduced to third class. This step was taken in view of the fact that during the 49 years that the observatory has been in existence sufficient data have been obtained to give complete knowledge of the climatology of the district. The third class observatory will give all the information necessary for weather changes from day to day, and the reduction has made it possible to employ the staff of the observatory on more useful work in connexion with the investigation of the upper air at Agra.

Strenuous work by Mr. Field and his staff at Agra has resulted in the Aerological Observatory being fully equipped, and the observational and experimental work connected with the investigation of the upper air is now in full swing.

An important change in the internal administration of the department was effected during the year in consequence of which the work connected with the accounts of the department has been transferred from the Calcutta to the Simla office.

Concluding Remarks.

36. The Meteorological Department owes a large part of its usefulness to the sympathetic assistance it receives from outside departments. Civil Surgeons and other officers of Government departments, as unpaid superintendents of observatories and in other capacities, help in the meteorological work; the Telegraph and Postal Departments assist in every way in the rapid transmission of meteorological information, at the same time that they allow their employees to act as observers. The Eastern Telegraph Department, by transmitting the daily Aden message free, and the Indo-European Telegraph Company by giving free transit to the daily records of the Persian observatories, place a large volume of most valuable information at the disposal of the Meteorological Department.

Weekly telegrams were received from the 1st May to the 15th October from the Director of the Royal Alfred Observatory, Mauritius, as well as from the departmental observatories at Zanzibar and Seychelles. These telegrams gave valuable information of the weather conditions in the Indian Ocean and the Department is indebted to the officers indicated for the punctual transmission of the information. Thanks are more specially due to the Director of the Royal Alfred Observatory for his courtesy in placing the meteorological data of that observatory at the disposal of the Indian Meteorological Department.

The Department is greatly indebted for important information as to meteorological conditions prevailing antecedent to and during the south-west monsoon, to the Director, Agriculture and Forestry Department, Zomba, British Central Africa; the Meteorologist, Dar-es-Salaam; His Majesty's Commissioner, Entebbe, Uganda; the Director, Physical Services, Survey Department, Cairo; the Commonwealth Meteorologist, Melbourne; the Directors of the Observatories at Buenos Ayres and Santiago; and to the various officers around the Indian frontiers who have collected and supplied valuable snowfall information.

The central office of the Meteorological Department at Simla was under the charge of Dr. Walker and the general administration of the Department was in his hands, while the local officers who have helped very materially with the current work of the Department were as follows:—Calcutta, Mr. C. W. Peake and Dr. E. P. Harrison; Madras, Mr. R. Ll. Jones; Bombay, Mr. G. W. Talbot and Mr. W. P. Henderson; and Allahabad, Dr. E. G. Hill and Mr. A. P. Sircar.

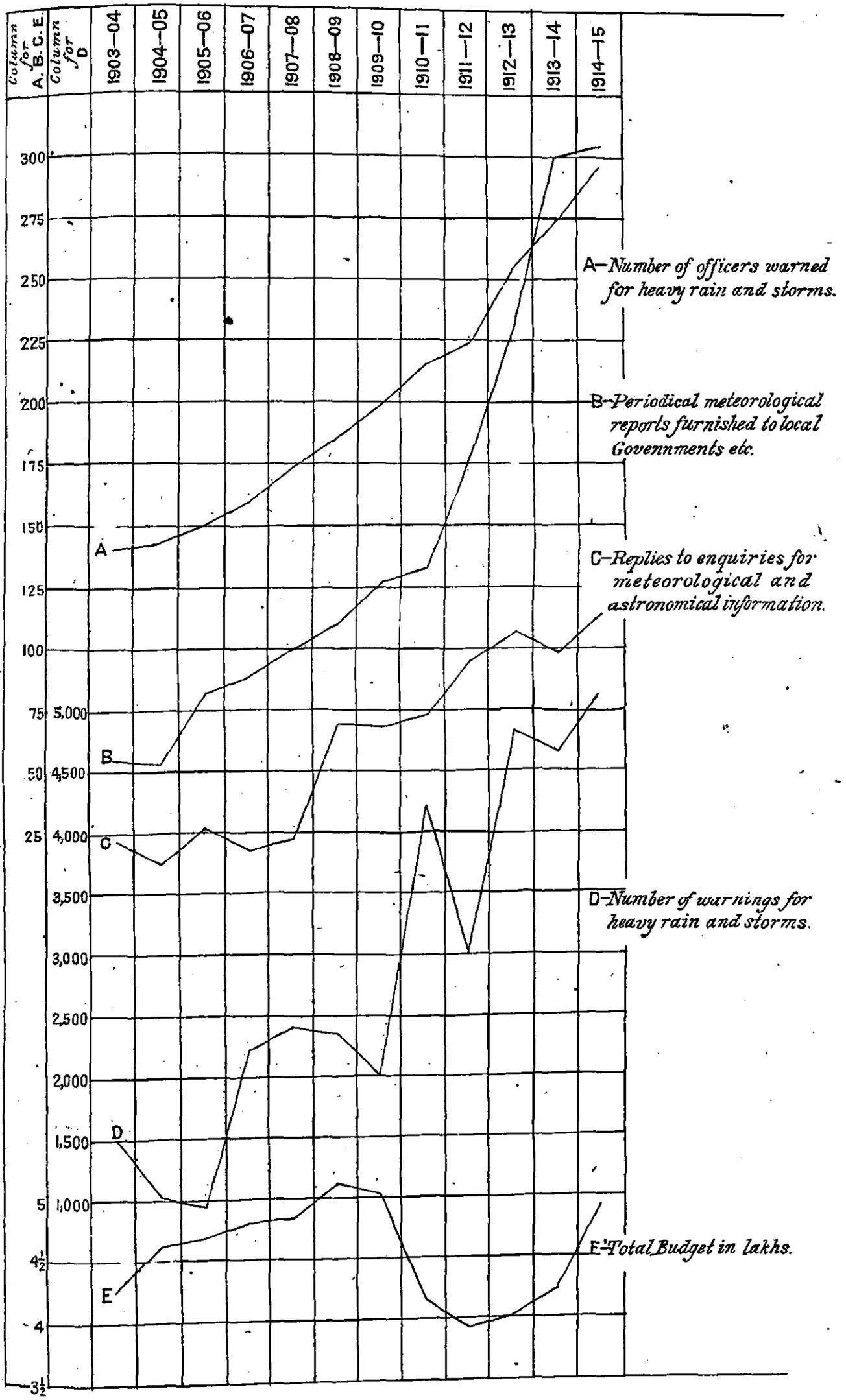
GEORGE C. SIMPSON,

Offg. Director-General of Observatories.

Simla, the 8th September 1915.

G. M. Press, Simla.—No. 1DGofO—30-9-15.—290—M.D., etc

DIAGRAM SHOWING GROWTH IN DEPARTMENTAL ACTIVITY AND CHANGES IN TOTAL COST



REPORT ON THE ADMINISTRATION OF THE METEOROLOGICAL DEPARTMENT OF THE GOVERNMENT OF INDIA IN 1915-16.

CHANGES IN THE STAFF DURING THE YEAR.

Dr. Gilbert T. Walker was on combined leave from the 18th March 1915 to the 7th November 1915. Dr. G. C. Simpson acted for him.

Dr. G. C. Simpson was placed at the disposal of the Army Department for service as a Meteorologist in Mesopotamia from the 25th March to the 25th May 1916.

Mr. C. W. B. Normand was appointed to the Indian Army Reserve of Officers with effect from the 29th February 1916.

Mr. W. A. Harwood was on medical leave for 21 days from the 1st July to the 21st July 1915. He was appointed to the Indian Army Reserve of Officers with effect from the 10th February 1916.

Rai Bahadur Hem Raj was on privilege leave from the 10th January to the 4th March 1916. Mr. Bion acted.

Dr. E. P. Harrison, Professor, Presidency College, Calcutta, was placed on special duty in the Simla Meteorological Office for four months from the 1st July 1915, but he was appointed to the Indian Army Reserve of Officers from the 30th July 1915.

Dr. T. Royds was on special leave from the 1st March 1915 to the 29th May 1915 in continuation of privilege leave. Mr. S. Sitarama Aiyar acted.

Dr. N. A. F. Moos was on privilege leave from the 31st January to the 30th April 1915. Mr. Mukandrai Virshunker Unaker acted.

Mr. W. P. Henderson was Meteorologist, Bombay, until the 30th April 1915 and was then succeeded by Mr. C. D. deV. Babington.

Dr. E. G. Hill was on leave for 2 months and 24 days from the 21st April to the 14th July 1915. Mr. A. P. Sircar acted. The post of Meteorologist, Allahabad, was abolished from the 1st August 1915.

OBSERVATORIES.

2. The observatories maintained by the Government of India are classified as follows :—

First Class.—Observatories which are furnished with autographic instruments for continuously recording pressure, temperature, humidity, and wind direction and velocity, in addition to instruments read by eye.

Second Class.—Observatories at which readings are taken daily at 8 hrs., 10 hrs., and 16 hrs.: those at 8 hrs. are (with a few exceptions) transmitted by telegram to one or more of the offices at Simla, Calcutta, Bombay and Madras for inclusion in India or Provincial Daily Weather Reports.

Third Class.—Observatories—

(*a*) where readings are taken daily at 8 hrs. only; at those stations where there are telegraph offices the observations are transmitted by telegram for inclusion in the Simla, Calcutta, Bombay or Madras Daily Weather Reports;

(*b*) at stations where there are no telegraph offices, and observations are recorded at 10 hrs. and 16 hrs. only; these are included in the Monthly Weather Reviews, and furnish a series of observations for the determination of monthly and daily means which should be comparable with the means already obtained for second class observatories.

Fourth Class.—Observatories at which observations of temperature, wind and rainfall only, or of temperature and rainfall only are recorded.

Fifth Class.—Observatories which telegraph rainfall only.

3. At the end of the year the total number of observatories was 274 of which 41 were non-departmental and 233 were maintained by the Government of India. Of the 233 departmental observatories, 5 were first class, 2 second class, 182 third class, 22 fourth class, and 22 fifth class.

4. The changes in the observatories during the year were the following :—

The first class observatory at Dodabetta was closed on the 5th September 1915 and the third class observatories at Thayetmyo and Pharijong were closed on the 1st June 1915 and 13th August 1915 respectively. The third class observatory at Table Island was closed temporarily on the 1st January 1916. The second class observatory at Mukteswar was reduced to third class on the 1st October 1915, and the fouth class observatory at Seistan was raised to third class for a period of 12 months from 1st January 1916.

First Class Observatories.

5. The Directors of the Observatories of Kodaikanal, Madras and Bombay publish separate annual reports which are forwarded for the information of Government. It has accordingly been ruled as unnecessary to include information relating to the working of these observatories in this Administration Report.

6. *Alipore Observatory.*—This observatory is under the charge of the Meterologist, Calcutta. The following special instruments were in use during the year :—

Bergholz and Kew barographs, a Dines' microbarograph, Kew and Richard thermographs, a Beckley anemograph, a Dines' pressure tube anemometer, Beckley, Hellman-Fuess and monthly rain-gauges, an Omori-Ewing seismograph, grass and ground thermometers, and anephoscope.

All instruments issued by the Meteorological Department are tested at this observatory and their corrections ascertained before they are sent out for use. The number of instruments tested and verified during the year was 991 as compared with 804 last year : 51 instruments were condemned as unfit for issue, or were sent to the India Office for repair and 22 instruments were kept in store for future treatment. In addition to the above, 249 instruments were examined and issued to other observatories.

The observatory gives mean Calcutta time to the port and shipping. Three time balls are dropped daily at 1 P.M., local mean time throughout the year, one on the Semaphore Tower at Fort William, the second at the Port Commissioners' office and the third at the Kidderpore Docks. This work was carried out quite satisfactorily as far as this department is concerned. There were 17 failures, as compared with 15·3, the average number of the past 27 years ; but in all cases they were due to defects in the electric or mechanical arrangements outside the observatory, for which this department is not responsible.

Year.	Number of days on which one or other ball failed to drop properly.	Number of failures due to telegraphic defects.
1915-16	17	17
1914-15	24	24
1913-14	36	36
1912-13	50	50
1911-12	21	21

7. *Lahore Observatory.*—The following special instruments were in use during the year :—

Draper and Richard barographs, a Casella rain-gauge, a Beckley anemograph, a sunshine recorder, grass and ground thermometers, and a nephoscope.

Eye observations of the ordinary meteorological instruments were taken seven times daily at this observatory as in past years at 6, 8, 10, 14, 16, 18, and 22 hours. Ground surface temperature was recorded four times daily at 6, 10, 16, and 22 hours. Cloud observations were taken daily by nephoscope at 8, 12, and 16 hours for use at the Aerological Observatory, Agra.

Character of the work of Observation at second and third class observatories.

8. The general character of the work of the observatories, as judged by the number of mistakes made by observers, was satisfactory.

The number of stations of great reliability, in which either no mistake or only one mistake has been detected in the data for the Indian Daily Weather Report, was 27 as against 21 in 1914-15; while, the number of stations at which more than 50 mistakes were made was 4 as against 5 last year.

The usual list showing the number of mistakes in observation and in the preparation of telegrams for all the observatories which send weather telegrams to the Simla office was prepared and circulated to the observatories on the 3rd July 1916.

Inspection of Observatories.

9. The number of visits paid to observatories during the year under review was 39 as compared with 76 in the previous year and an average of 60 during the past 10 years. The number was cut down for purposes of economy.

The Director-General inspected the observatories at Calcutta, Bombay, Alibag, Agra and Allahabad. Mr. Normand inspected 2; Mr. Bion 8; Mr. P. K. Ghose 17; Mr. M. G. Subrahmanyam 5, and Mr. Budha Mall 2.

Of the 34 third class observatories that were visited 24 were reported as good, 10 as tolerable, and none as bad.

Condition.	Second or third class observatories inspected in					
	1915-16.	1914-15.	1913-14.	1912-13.	1911-12.	1910-11
Good or satisfactory	24	52	34	31	20	23
Tolerable	10	14	23	17	16	31
Bad	..	3	6	3	1	3
Total ..	34	69	63	51	37	57

In estimating the general character of the observatories from the above table it must be remembered that it is, as a rule, on account of something unsatisfactory that a visit of inspection is made. The general level of the stations is thus decidedly better than might otherwise appear. The most frequent cause of bad work is the changing of observers at short intervals necessitated by acting and other arrangements in the Medical, Telegraphic and Postal Departments.

Special observations.

10. Observations other than those recorded at regular intervals are made as follows:—

(*a*) In accordance with orders issued from the Simla or Calcutta office, when weather is disturbed and storm warnings may have to be issued; such observations are reported by telegraph. Certain observers at coast observatories are in receipt of a regular monthly allowance of Rs. 5 for sending special storm warning telegrams, while other observers receive an allowance of Re. 1 for each set of special observations sent under instructions from either Simla or Calcutta. The total number of telegrams forwarded during the year under review was 1,448 compared with 1,449 despatched the previous year.

(*b*) Certain observers, when they consider that conditions at sea are sufficiently threatening, send of their own initiative to Simla or Calcutta a telegram containing special observations. Only one such telegram was received.

(*c*) In connection with flood warning a number of observers have been instructed to send telegrams announcing the occurrence of heavy rainfall to Government officers and certain railway engineers who desire early information. The number of telegrams so sent was 191 as compared with 207 last year.

(*d*) Observers are instructed to send detailed information of earthquakes to the Simla Meteorological Office and to the Director, Geological Survey, Calcutta; for this work they are paid awards from this department. Of such reports 75 were received during the year.

Observations with special Meteorological Instruments.

11. The following special observations were carried out during the past year at certain selected stations:—

1st—Wind observations recorded by Beckley anemographs at 8 stations, and by Dines' pressure tube anemometers at 4 stations.

2nd—Solar and terrestrial radiation observations at 1 and 9 stations, respectively.

3rd—Underground temperature observations at 2 stations.

4th—Sunshine observations at 6 stations.

5th—Barometric observations recorded by self-registering instruments, chiefly Richard barographs at 18 stations.

6th—Temperature observations recorded by self-registering instruments, chiefly Richard thermographs, at 8 stations.

Observations of Solar Energy in absolute units.

12. Observations were continued at Simla throughout the year, when weather conditions allowed, by means of Angstrom's electric pyrheliometer.

Upper Air Examination.

13. The work with pilot balloons observed by theodolites was continued in north India at Agra, Simla and Kojak, and for south India at Bangalore, where the work is in the hands of the Meteorological Officer of the Mysore State and has been carried out with admirable zeal and accuracy. The trajectories to standard scale of the paths of all balloons are charted for determination of normal and abnormal conditions of wind strength and direction at all heights reached, *i.e.*, up to 10 or 11 kilometers. The number of these records now available is sufficient to provide a useful basis for a preliminary estimate of normal conditions for the various seasons of the year: the figures have accordingly been put into convenient form, and their analysis is nearly completed for publication.

In addition, pilot balloons were used for a short period at Nagpur; and balloons carrying instruments were sent up at Poona during the monsoon of 1915 and at Agra from June 1915 onwards continuously. A large proportion of these were found and returned, and those with good records afford information as to the temperature gradients and humidities at all heights reached.

The examination of past cloud records at representative stations in India for the period 1875 to 1914 has been completed for publication, and further observations at selected stations continue.

Researches by the Simla Staff.

14. Owing to the transfer of the laboratory and mechanics from Simla to Agra the opportunities for experimental research in Simla have become very greatly reduced and no experimental work is at present being undertaken in Simla. A small amount of work of a statistical nature, however, has been possible during the year, and progress has been made with the problem of forecasting the local distribution of monsoon rainfall. By combining those areas which are sufficiently homogeneous an area 'India, main' has been obtained for the monsoon rainfall of which the correlation coefficient with factors available at the beginning of June is ·7 instead of ·6, the previous coefficient for the whole of India: and as this 'India, main' contains the United Provinces, the Punjab, the North-West Frontier Province, Sind, Rajputana, Bombay, Central India, the Central Provinces, Hyderabad, Mysore, the north Madras coast and Orissa it is sufficiently large to be of considerable practical value.

Seismograph Observations.

15. Seismological observations were recorded throughout the year by two Omori-Ewing seismographs at Simla and Calcutta and one at Bombay; by Milne

seismographs at Kodaikanal and Colaba (Bombay); and by means of other self-registering instruments at the last named station. All the instruments worked satisfactorily throughout the year, and copies of certain records were transmitted to the Seismological Committee of the British Association.

Marine Meteorology.

16. No change was made during the year under review in the method of collecting marine information.

At Calcutta and Bombay a clerk at each port spends his whole time in visiting ships, making in each case a copy of the log and a comparison of the ship's barometer with a secondary standard, for the purpose of applying the necessary corrections to the readings in the logs; and, after the barometer comparisons have been made a statement of the error of the ship's barometer is given to the captain, in case he should desire to make use of it. The number of ships visited is materially less than that of the vessels which come into port, but it is ample for the purposes of the department.

The data thus obtained are utilised in the preparation of charts of disturbances in the Bay of Bengal and the Arabian Sea for future reference in connection with the storm warning work of the department, and in drawing up an account of the storms of the year for publication in the Annual Summary.

The arrangement made with Royal Alfred Observatory at Mauritius, for collecting marine data from the Indian Ocean, has been continued and the thanks of this department are again due to that office for thus supplying a large amount of useful data. No such data were received from the London Meterological Office during the year.

Observations recorded during the year at the entrance of the River Hughli were supplied to the Meteorological Department by the light-vessel "Star."

Snowfall Registration in the Mountain Districts to the North and West of India.

17. The information as to the amount, distribution and time of occurrence of the snowfall in the Himalayan and Afghan mountain areas was on the whole tolerably complete, and the thanks of the department are again due to the various officers who have collected and forwarded it. Additions to the information received have been obtained by continuing the series of large-scale photographs of the snows, as seen from Simla, which was started in 1905.

Rainfall Registration.

18. The registration of rainfall in India has invariably been carried out by the provincial authorities. In 1889 a uniform system was introduced by the Government of India, and the Director-General of Observatories was made consulting officer in connection with this work. His advice is sought regarding the starting of new rain-gauge stations, and he receives annual reports from the local officers responsible for the registration of rainfall upon the efficiency of the work. A general account of the system, which came into operation in the year 1891-92, will be found on pages 5—8 of the Administration Report of the year 1889-90, and on pages 6 and 7 of the Administration Report for the year 1890-91.

The following is a statement of the number of rain-gauge stations from which data were being received for publication in the Rainfall Data of India at the end of the year under review :—

Province or Division.	Number of rain-gauges supplying returns for publication on 31st march 1916.	Province or Division.	Number of rain-gauges supplying returns for publication on 31st March 1916.
Burma	212	Baluchistan	90
Assam	125	Rajputana	185
Bengal	227	Bombay and Sind	289
Bihar and Orissa	296	Central India	177
United Provinces	276	Central Provinces	181
Punjab	189	Hyderabad	19
Kashmir	37	Mysore	77
North-West Frontier Province	35	Madras (including Pudukkottai, Coorg, Travancore and Cochin).	527

The following paragraphs give a brief summary of the reports of the officers in charge of rainfall registration for the year 1915-16 :—

Assam.—The total number of rainfall stations was 125 against 124 in the preceding year. The number of gauges inspected was 86, or 6 less than in the previous year, the total number of inspections being 143 against 187 the previous year. Inspections of 45 rain-gauges were made more than once.

Baluchistan.—There were at the close of the year 91 rain-gauges : of these 44 were maintained by the railway department at railway stations, while 38 (excluding those attached to departmental observatories) were under the civil and irrigation departments. Twenty rain-gauges were inspected : the result of these inspections was generally satisfactory and the gauges were found to be in good order.

Bihar and Orissa.—The total number of rain stations including those in the Orissa Feudatory States and Tributary Mahals was 296 against 294 last year. Inspections of 163 rain-gauges were made and 164 inspection cards were received, against 155 and 99 respectively last year. The rain-gauges were mostly in good condition, and the work of registration was generally done satisfactorily.

Bengal.—There were 227 rainfall stations in the Province or three more than last year. Of these 64 stations were inspected, as against 32 in the previous year.

Bombay and Sind.—There were 278 rain-gauges in British districts as in the previous year and of these 216 were inspected as compared with 207 last year. The total number of inspections amounted to 347 against 324 last year and 101 gauges were inspected more than once. There was some falling off in the work in Native States, in that 36 gauges (out of 61) were inspected as compared with 46 inspected the previous year, seven gauges being inspected more than once.

Burma.—There were 212 rain recording stations as against 211 the previous year : of these 18 were meteorological observatories, 25 in charge of the Public Works Department, and 2 under the Agricultural Department. Inspections of 146 rain-gauges were made, an increase of 6 as compared with last year. Of these 95 were reported in good, 44 in a fair, and 7 in a bad state.

Central Provinces.—The number of rain-gauges maintained during the year was 118, as in the previous year. The number of inspections of which reports were received was 179 against 130 in the preceding year. The registration continued to be efficiently carried out.

Hyderabad.—The rainfall registering stations of Hyderabad are in charge of the Nizam's Public Works Department. There are 17 such stations as against 16 last year, all of which have been inspected and found in good condition. In addition, there is a rain-gauge at the Residency Hospital in charge of the Residency Surgeon, and one at Bolaram in charge of the Senior Medical Officer.

Kashmir.—There were 37 rain-gauges in this State, of which 8 are meteorological observatories and the remainder are in charge of the Revenue Department. Only seven gauges were inspected as compared with two inspections made last year.

Madras.—There were 499 rain recording stations at the close of the year under review, of which 397 were in the Madras Presidency : in the preceding year the corresponding figures were 477 and 394. The number of stations inspected was 391 as against 388 inspected the previous year.

Mysore.—At the close of the calendar year 1915 the number of rain recording stations was 225, the same as in the previous year. Out of these, 203 or 90 per cent. were inspected as against 86 per cent. during the previous year.

North-West Frontier Province.—The report on rainfall registration contained in the current administration report of land revenue, land records and agriculture of this province refers to the year 1914-15 and states that there were no changes in the situation or number of the rain gauges, except the rain-gauge at Tank, which was removed to a better site in the compound of the Tank Tahsil. The rain-gauge at Lakki was also found to be unreliable and will be moved. The rain-gauge sanctioned in 1913 for Tarnah has not yet been set up. The rainfall registers are properly kept up and are complete.

Punjab.—The number of rain-gauges in the Punjab during the calendar year 1915 was 244 or 13 more than last year. Of these, 149 were in charge of district officers and 95 under canal officers. There were 42 inspections during the year as against 55 last year. In addition numerous inspections were made by the Director of Land Records and his Personal Assistants. The rain-gauges under both district and canal officers are reported to be in good order and the records well kept up.

United Provinces.—There were 288 rain reporting stations in these provinces including the meteorological observatories. Out of 274 stations under the supervision of district and canal officers, 62 per cent. were inspected during the year.

Summary.—In the Central Provinces, Hyderabad, Madras, and Mysore over 75 per cent. of the rainfall stations were inspected; in Assam, Bihar and Orissa, Bombay, Burma, and the United Provinces over 50 per cent.; Bengal 28 per cent.; Baluchistan 22 per cent.; Kashmir 19 per cent; and the Punjab 17 per cent.

The Symons' rain-gauge is being introduced throughout the Punjab Irrigation Department and will thus be universally adopted throughout British India.

The System for Storm Warning.

19. The work of warning Indian ports of the approach of cyclonic storms or of bad weather is performed from the Simla Office by the Director-General of Observatories, and from the Calcutta office by the Meteorologist, Calcutta.

The following ports are warned from Simla for storms in the Arabian Sea :—

Aden, Karachi, Cutch Mandvi, Jamnagar, Dwarka, Porbandar, Veraval, Jafarabad, Bhavánagar, Daman, Bombay, Alibagh, Murud Janjira, Harnai, Ratnagiri, Malvan, Vengurla, Nova Goa, Marmagao, Karwar, Kumta, Honavar, Mangalore, Tellicherry, Calicut, Cochin, Alleppy and Colombo.

The Meteorologist, Calcutta, warns the following ports for storms in the Bay of Bengal :—

Colombo, Tuticorin, Pamban, Negapatam, Porto Novo, Cuddalore, Madras, Masulipatam, Cocanada, Vizagapatam, Calingapatam, Gopalpur, Puri, Hukitala (False Point), Chandbali, Balasore, Sandheads, Saugor Island, Diamond Harbour, Mud Point, Budge Budge, Calcutta, Morelganj, Barisal, Goalundo, Narayanganj, Noakhali, Chittagong, Cox's Bazar, Akyab, Kyaukpyu, Diamond Island, Bassein, Rangoon, Elephant Point, Moulmein, Tavoy, Mergui, Table Island (closed from 1st January 1916) and Port Blair.

The following River Police stations in Eastern Bengal and Sunderbans are also warned :—

Mudna, Nikli, Bhairab, Jaikalipur, Daudkandi, Chandpur, Pirojpur, Mirzaganj and Niamati.

20. In addition to special messages sent during stormy weather the Meteorologist, Calcutta, used to provide shipping during a large part of the year with daily information regarding the weather over the Bay. This information was made available by means of daily weather telegrams to an officer at the Port or by the hoisting of flag signals. But with the introduction of the new storm signal code on 1st January 1916, the 8 word telegrams and flag signal messages were discontinued and the following ports received daily telegrams from this office under the "General system with additional signals."

(1) Elephant Point.
(2) Diamond Island.
(3) Akyab.
(4) Chittagong.
(5) Negapatam.
(6) Cocanada.
(7) Madras.
(8) Cuddalore.
(9) Porto Novo.
(10) Bassein.
(11) Rangoon.
(12) Saugor Island.
(13) Sandheads.

Note.—At the Sandheads signals are not exhibited but information is available for passing vessels.

21. In accordance with resolutions passed at the International Radio-Telegraph Conference held in London in June and July 1912, the Indian radio-telegraph coast stations are now supplied with telegrams containing meteorological information with regard to the Arabian Sea and the Bay of Bengal. The messages are sent to the radio stations at Bombay, Karachi, Calcutta, Rangoon, Madras, and Port Blair for broadcast transmission by wireless to the shipping in the Arabian Sea and the Bay of Bengal.

Arrangements made for the receipt by wireless telegraphy of meteorological observations from ships at sea worked satisfactorily up to August 1914, when owing to the outbreak of the war these wireless telegrams had to be discontinued. A few telegrams, however, were received in 1915-16.

Warnings for Storms in the Bay of Bengal.

22. During the year warnings were issued for sixteen disturbances. Three of these developed into st›rms of some severity and were of sufficient importance for a statement to be given here of their course and of the action taken.

(1) On the morning of the 24th August there was a tendency towards the formation of a depression off the north Madras coast, and a well marked depression was shown there next morning. After travelling slowly northwards on the 26th and 27th, during which time it was increasing in depth, it lay near False Point on the morning of the 28th, and crossed the coast between False Point and Balasore during the next twenty-four hours.

The ports which were likely to be affected, or from which ships might run into the storm, were informed daily from the 26th of the progress of the storm and the appropriate signals were hoisted. The action taken with regard to Hukitala (False Point) is shown by the following telegrams :—

Hukitala (False Point).

26th August 1915 at 11 hrs. 8 mins. "Hoist warning* signal. Storm centre roughly latitude eighteen longitude eighty-six moving between north-west and north."

26th August 1915 at 11 hrs. 41 mins. "Storm signal hoisted at Saugor."

27th August 1915 at 10 hrs. 52 mins. "Lower warning signal. Hoist danger signal number three† storm slight intensity. Centre now near Gopalpur at present appears moving towards Puri."

28th August 1915 at 11 hrs. 34 mins. "Storm at present slight now near False Point moving northwards."

29th August 1915 at 5 hrs. 46 mins. "Lower storm signal. Storm has passed inland. Storm signal lowered at Saugor."

(2) A storm formed on the 27th September over the Andamans and on the morning of the 28th it was lying near Table Island. It then travelled in a west-north-westerly direction across the Bay and after approaching the Madras coast near Waltair on the 1st October took an abnormal course to the south-west, and slowly skirted the coast line decreasing at the same time in intensity. It finally passed inland between Cocanada and Masulipatam on the 2nd October.

Information was given daily to the ports concerned from the 28th, and the action taken with regard to Vizagapatam and Cocanada is shown by the following telegrams :—

Vizagapatam.

30th September 1915 at 10 hrs. 12 mins. "Hoist warning* signal. Storm about two hundred fifty miles east of Waltair moving some direction between north and west."

1st October 1915 at 5 hrs. 18 mins. "Lower warning signal. Hoist danger signal number three.† Storm possibly severe approaching coast between Waltair and Calingapatam."

1st October 1915 at 10 hrs. 10 mins. "Storm now close to coast between Waltair and Calingapatam winds may be very strong during the day."

1st October 1915 at 22 hrs. 56 mins. "Lower storm signal. Storm has crossed coast moving south-west inland. Its centre now near Cocanada."

2nd October 1915 at 11 hrs. 35 mins. "Depression inland near Masulipatam giving strong easterly winds from Cocanada to Puri."

Cocanada.

1st October 1915 at 5 hrs. 20 mins. "Hoist danger signal number two.‡ Storm possibly severe approaching coast between Waltair and Calingapatam."

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* Indicating that a cyclonic storm has formed, which will probably advance to that part of the coast on which the port is situated, but is still at a considerable distance from it.

† Indicating that a cyclonic storm (probably of slight to moderate intensity) is affecting the port, and that its centre will probably cross the coast over or near to the port.

‡ Indicating that a cyclonic storm (probably of slight to moderate intensity) is affecting the port, and that its centre will probably cross the coast considerably to the north of the port.

1st October 1915 at 22 hrs. 56 mins. "Lower storm signal. Storm has crossed coast moving south-west inland. Its centre now near Cocanada."

2nd October 1915 at 11 hrs. 35 mins. "Depression inland near Masulipatam giving strong easterly winds from Cocanada to Puri."

(3) Weather was disturbed in the neighbourhood of the Andamans at the beginning of December and a storm formed in this area on the 2nd. Its centre was situated to the west of Port Blair on the morning of the 3rd and it then travelled northwards; but on reaching the neighbourhood of Table Island on the 4th it took an unusual course to the east and disappeared over the north of the Andaman Sea, probably on the night of the 5th.

Information was sent daily from the 1st to the Andamans and the Pegu coast ports, and at various times as occasion demanded warnings were sent to other ports in Burma and also to the south Madras ports when at one time the storm appeared to be moving westwards. The action taken with regard to Rangoon is shown by the following telegrams:—

RANGOON.

1st December 1915 at 10 hrs. 56 mins. "Storm probably forming west or south-west of Port Blair."

2nd December 1915 at 11 hrs. 44 mins. "Disturbance possibly severe about latitude eleven, longitude eighty-six or further east now moving towards south Madras coast."

3rd December 1915 at 10 hrs. 48 mins. "Storm about three or four hundred miles west Port Blair intensifying and at present stationary."

4th December 1915 at 10 hrs. 56 mins. "Hoist great danger signal number two.* Severe storm west Table Island moving some northerly direction."

4th December 1915 at 16 hrs. 42 mins. "Storm near Table Island is possibly moving into Andaman Sea and if so may pass near Rangoon. Shall wire again at twenty-two hours if necessary."

4th December 1915 at 21 hrs. 48 mins. "Hoist great danger signal number three.† Storm now in Andaman Sea. Will probably cross coast between Diamond Island and Moulmein to-night or early to-morrow. Suggest immediate precautions port."

5th December 1915 at 10 hrs. 38 mins. "Storm north-east Table Island moving slowly towards Rangoon or Moulmein possibly now less severe but do not relax precautions. Shall wire again about sixteen hours."

5th December 1915 at 15 hrs. 25 mins. "Storm in north Andaman Sea moving very slowly and probably diminishing in intensity. Shall wire again at twenty-two hours."

5th December 1915 at 21 hrs. 22 mins. "Storm diminished in intensity but not crossed coast. Will wire again about six hours. Better not relax precautions yet."

6th December 1915 at 6 hrs. 8 mins. "Observations at two hours shew storm not yet inland but probably much reduced intensity. Will wire again at ten hours."

6th December 1915 at 10 hrs. "Lower storm signal. Storm almost disappeared. Is likely to cross coast if it continues to exist between Moulmein and Mergui."

Perhaps in the case of the second storm the signals at Vizagapatam and Cocanada were lowered rather too early, but there is no question that the warnings have been effective on all occasions through the year.

WARNING FOR STORMS IN THE ARABIAN SEA DURING THE YEAR.

23. The Simla office warns the west coast ports, not only for storms, but also for squally weather, especially at the beginning of the monsoon. There were nineteen periods of disturbed weather in the Arabian Sea, for which warnings were issued, but none of these disturbances developed into a storm. In addition to the warnings issued to ports, telegrams giving information regarding weather were sent to the Director of Indian Marine, Bombay, in connection with the despatch of steamers to the Persian Gulf.

* Indicating that a cyclonic storm of great intensity is affecting the port, and that its centre will probably cross the coast considerably to the north of the port.

† Indicating that a cyclonic storm of great intensity is affecting the port, and that its centre will probably cross the coast over or near to the port.

Flood Warnings and Weather Forecasts to District, Irrigation, Railway and other Officers.

24. This work is carried out chiefly by the Simla Meteorological Office, and partly by that of Calcutta. The arrangements have been made at various times and differ considerably in character, according to the nature and extent of the flood or weather warnings required by the officers concerned. In most cases these officers require telegrams either warning them of advancing storms likely to give heavy rain, or informing them of the actual occurrence of heavy rainfall likely to give rise to severe floods which might injure railways or canal works; and in other cases they require warnings or forecasts of the weather for as long a period beforehand as possible.

The number of district officers and officers in the irrigation, telegraph, railway and other departments requiring warnings from Simla amounted at the end of the year to 201, an increase of 55 during the year.

This number does not include captains of mail steamers and other vessels who occasionally telegraph from Karachi, Aden and other ports for the latest intelligence respecting the position and movement of cyclonic storms, nor does it include the names of other individuals or firms who ask for special forecasts.

25. The number of warning messages sent from Simla during the year 1915-16 was 2,838 as compared with 2,060 in 1914-15 and 1,840 in 1913-14.

The number of warnings for heavy rainfall sent from Calcutta during the year 1915-16 was 909 as compared with 1,003 in 1914-15.

26. Instructions were issued by the Government of India in 1898 that every officer to whom storm or flood warnings are issued, should in the month of January of each year or, in the case of military expeditions, at the close of the campaign, forward to the head of this department a brief return of the warnings received and should also report—

(1) whether the warning telegrams were rapidly transmitted and delivered by the Telegraph Department,

(2) whether the warnings were timely and satisfactory in every respect and, if not, in what points they were defective,

(3) whether any changes might be made in the system which would make the warnings more useful.

Reports on the ordinary storm and flood warnings for the calendar year 1915 were received from 41 officers. Of these 30 stated that the warnings were satisfactory, 5 offered no remarks, and 4 reported that they had received no warnings during the year, while one stated that the warnings supplied usually arrived after the bad weather had begun and another that they were too vague. Enquiries indicate that in the present state of meteorological science the complaint of the last officer cannot be met.

A comparison of the reports of floods and of heavy rain with information supplied to the various officers would appear to show that the system is working satisfactorily, and that most of the warnings issued were in time and of use to the recipients.

Seasonal Forecasts.

27. The forecast for the monsoon period of 1915 dated the 7th June, was sent to Local Governments and Administrations, communicated to the press, and printed in the Gazette. A statement of the rainfall of June and July with a forecast for August and September was drawn up on the 6th August 1915 and published in a similar manner.

A statement of the actual rainfall during the monsoon period and a comparison of the two forecasts with actual rainfall was drawn up on the 19th January 1916, and sent to Local Governments and Administrations.

The following are summaries of these two forecasts, and a comparison of them with the actual rainfall—

Forecast dated 7th June 1915.	Remarks.
(*a*) While the monsoon of 1915 may not be so good as that of 1914 there are no indications of a serious deficiency in the total rainfall.	The deficiency in the total rainfall was three inches, and the effect was serious in parts of north-west India.
(*b*) The Arabian Sea current is likely to be less active than the Bay current.	The Bay current was roughly normal and the Arabian Sea current was in marked weakness.

Forecast dated 6th August 1915.	Remarks.
(*a*) Although there may be one or more breaks in the monsoon, the total rainfall for August and September is more likely to be above the average than below.	The period of August and September was less below the average than that of June and July.
(*b*) There appears no reason to doubt that north-west India will share in the improvement.	There was a marked improvement in the United Provinces, the Punjab East and North, and the North-West Frontier Province.

A deficiency is usually serious in some parts of India when its average over India is about three inches, and the June forecast regarding the total amount of monsoon rainfall was somewhat too optimistic.

The August forecast also was too optimistic regarding the total amount of rainfall.

In relation to the geographical distribution of rainfall the second paragraphs of both forecasts were correct.

28. A forecast of the probable character of the rains during January and February 1916 was prepared on the 3rd January 1916 and issued in the same manner as the forecast of the previous June. On the 28th June 1916 a comparison of the actual precipitation with the above forecast was issued.

The summary of the forecast issued was :—

> "It is probable that the total amount of rainfall in north-west India and of snowfall on the neighbouring hills will be distinctly less than usual."

The total rainfall was very decidedly less than usual, and the defect was shown in all the divisions. The snowfall of the period was in some areas approximately normal and in others less than usual.

The forecast proved correct.

Daily Telegraphic Weather Summary.

29. The summary was despatched daily at about noon. It was exhibited at certain telegraph offices and sent to 89 officers of Government. The subscribers, for longer or shorter periods, were 9 newspapers and 63 private individuals.*

* Last year the corresponding figures were shown as 18 newspapers and 41 private individuals; these should have been 10 newspapers and 34 private individuals.

To officers in Simla sheets containing the summary are distributed by hand, and in May 1915 a chart showing the rainfall of the day was introduced on the back of these sheets.

Publications.

30. There were no changes made during the year in the routine publications of the department of which a description will be found in the departmental Administration Reports of 1907-08 and 1910-11.

The following memoirs of the Indian Meteorological Department were published during the year 1915-16.

"A discussion of the anemographic observations recorded at Jubbulpore, Belgaum, Deesa and Karachi"; by W. A. Harwood, M. Sc., Assistant Director, Aerological Observatory, Agra, with an introduction by Gilbert T. Walker, C.S.I., M.A., Sc. D., F.R.S., Director General of Obervatories. (Memoirs of the Indian Meteorological Department, Volume XIX, Parts V to VIII.)

"Correlation in seasonal variations of weather, IV; sunspots and rainfall"; by Gilbert T. Walker, C.S.I., M.A., Sc. D., F.R.S., Director General of Observatories. (Memoirs of the Indian Meteorological Department, Volume XXI, Part X.)

"Correlation in seasonal variations of weather, V; sunspots and temperature"; by Gilbert T. Walker, C.S.I., M.A., Sc. D., F.R.S., Director General of Observatories. Memoirs of the Indian Meteorological Department, Volume XXI, Part XI.)

"Correlation in seasonal variations of weather, VI; sunspots and pressure"; by Gilbert T. Walker, C.S.I., M.A., Sc.D., F.R.S., Director General of Observatories. (Memoirs of the Indian Meteorological Department, Volume XXI, Part XII.)

"On the Calcutta standard barometer"; by E. P. Harrison, Ph.D., F.R.S.E., (Memoirs of the Indian Meteorological Department, Volume XXI, Part XIII.)

Supply of Meteorological information.

31. In addition to the meteorological information published by the department special information was supplied to the Meteorological Departments of England, Australia and Egypt.

Climatological information, at times involving special calculation, is also provided for sanitary and other officers of Government, as well as for private firms who are willing to pay the expense necessarily incurred. The extent to which the department is utilised in this manner is increasing steadily, as will be seen from the chart appended.

Miscellaneous.

32. Six hundred and fifty-five books and pamphlets, either purchased or presented by scientific bodies were added to the library during the year, as against eight hundred and seventy-seven in the year 1913-14. The reduction is attributable to the war.

Fourteen libraries, observatories or societies were added during the year to the list of institutions to which the publications of the Indian Meteorological Department are supplied, and two were removed; the number on the list is now 359.

Chief features of the year.

33. The most important departmental events of the year have undoubtedly been those caused by the war. Dr. Harrison, who is expected to take up the important task of warning the Bay of Bengal for storms as Meteorologist, Calcutta, early next year and had come to Simla to study the system, joined the Indian Army Reserve of Officers in July 1915; and on the return of the head of the department from leave in November all the gazetted meteorological staff placed their services at the disposal of Government. After selection, Messrs. Harwood and Normand were appointed to the Indian Army Reserve of Officers from the 10th and 29th February 1916, respectively; and later when a meteorological officer was asked for to give technical assistance in Mesopotamia, Dr. Simpson was deputed for the purpose from the 23rd March.

Special forecasts were made at Simla daily over several periods in connection with various military operations.

The scheme of upper air work has been very greatly hampered by the difficulty of obtaining materials at this time, but Mr. Field has succeeded in keeping up a supply of hydrogen not merely for his own balloons, but for those employed by Dr. Simpson and Mr. Harwood when on military duty. It was not expected that conclusions of importance would result from the first year of work of the scheme, but it would appear likely that the dates of the marked seasonal changes in the wind velocity at heights above seven miles may be used as an index of the earliness or lateness of the larger features of the Indian seasons.

Important events have occurred in connection with the system of warning for storms in the Bay of Bengal and Arabian Sea. Brief wireless messages giving information regarding weather in these regions were sent out broadcast to all ships within range, beginning in September 1915; and on the 1st January last the new system of storm signals was brought into force. The main improvements effected in this are that (*a*) it is uniform over the Indian Seas and makes a special code for Calcutta and the Hooghly ports unnecessary, (*b*) it provides separate warnings distinguishing the cases in which a port itself is threatened from those in which ships may run into danger after leaving the port, and (*c*) by simple locality signals exhibited at important places in the Bay it conveys information as to which of six areas into which the Bay has been divided are affected by bad weather, and so renders unnecessary the old special systems of flag signals and of eight-word telegrams.

One of the old landmarks of Indian meteorology has disappeared during the year. The United Provinces had half a century ago a weather officer of their own with the title of Meteorological Reporter to the Government of the United Provinces. When the department was unified in 1875, and the local officers were paid and controlled by the Government of India the titles were left unchanged, but in 1906 the new situation was more correctly expressed by new titles, the officer at Allahabad being called 'Meteorologist, Allahabad.' His duties consisted in superintending the collection and publication of provincial rainfall returns, supervising the local first class observatory, and writing meteorological reports for the Local Government. In every other province in India, however, with one exception, the rainfall work is conducted by the local government, while the first class observatory at Allahabad had been reduced to third class, and the Simla office prepares meteorological reports for other local governments. Thus a change was indicated and as a temporary experimental measure Mr. Field undertook to supervise the rainfall work at Allahabad from his observatory at Agra. But the geographical difficulties proved very great, and in February 1916 the friendly co-operation of the Local Government was sought for a solution. A scheme was then drawn up which involved the abolition of certain weekly returns that were not really required by anybody, and the transfer of the rainfall work to the Director of Land Records and Agriculture; it has since been sanctioned, and tends to efficiency in that the Local Government now control the rainfall work of its own officers, while the more technical meteorological work is carried on by the headquarters staff of the department.

Concluding Remarks.

34. The Meteorological Department owes a large part of its usefulness to the sympathetic assistance it receives from outside departments. Civil Surgeons and other officers of Government departments, as unpaid superintendents of observatories and in other capacities, help in the meteorological work; the Telegraph and Postal Departments assist in every way in the rapid transmission of meteorological information, at the same time that they allow their employees to act as observers. The Indo-European Telegraph Department, also, by giving free transit to the daily records of the Persian observatories, places a large amount of most useful information at the disposal of the Meteorological Department.

Weekly telegrams were received from the 1st May to the 2nd October from the Director of the Royal Alfred Observatory, Mauritius, as well as from the departmental observatories at Zanzibar and Seychelles. These telegrams gave valuable information of the weather conditions in the Indian Ocean and the Department is indebted to the officers indicated for the punctual transmission of the information. Thanks are more specially due to the Director of the Royal

Alfred Observatory for his courtesy in placing the meteorological data of that observatory at the disposal of the Indian Meteorological Department.

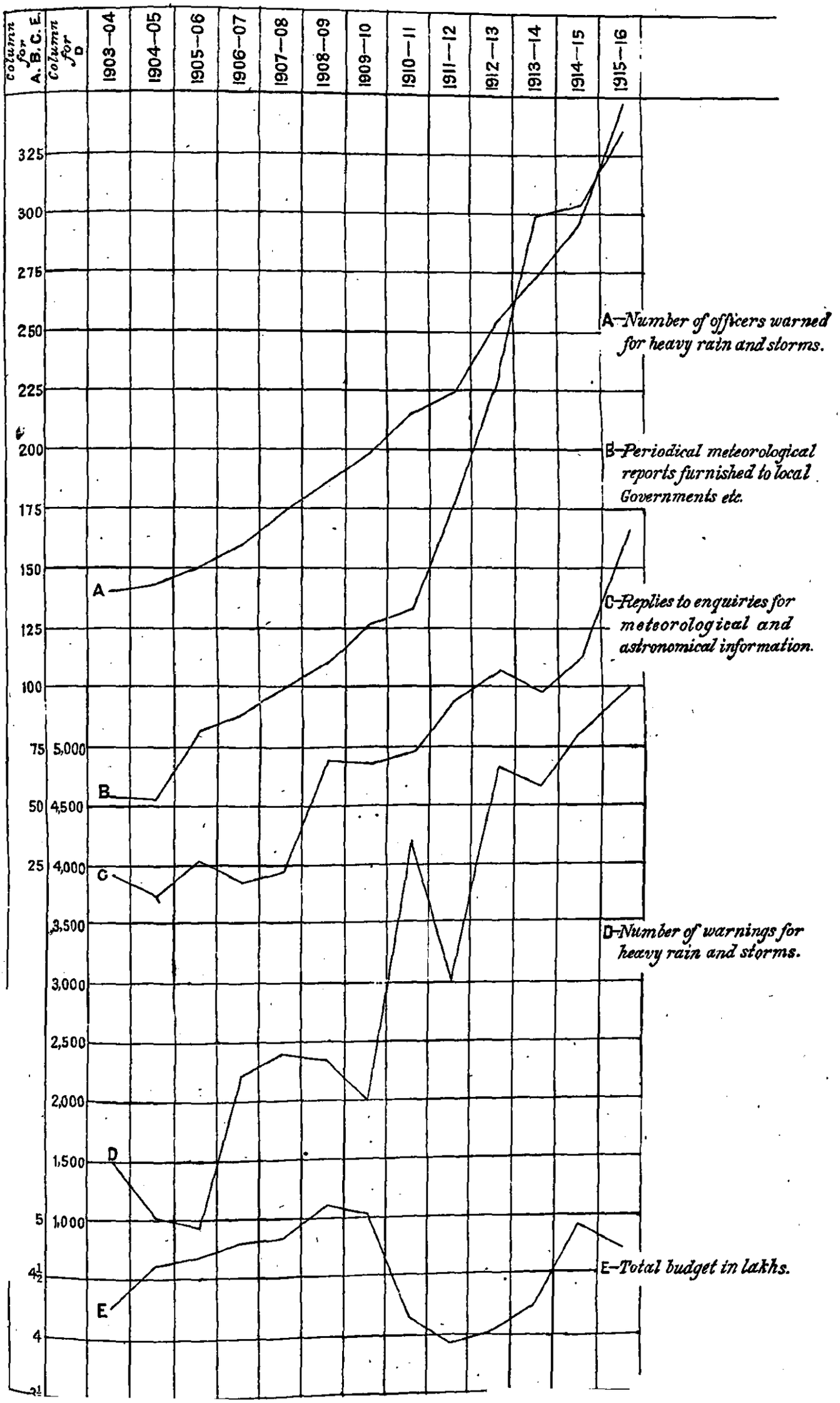
The Department is greatly indebted for important information as to meteorological conditions prevailing antecedent to and during the south-west monsoon, to the Director, Agriculture and Forestry Department, Zomba, British Central Africa; His Majesty's Commissioner, Entebbe, Uganda; the Director, Physical Service, Survey Department, Cairo; the Commonwealth Meteorologist, Melbourne; the Directors of the Observatories at Buenos Ayres and Santiago; and to the various officers around the Indian frontiers who have collected and supplied valuable snowfall information.

SIMLA;
The 12th September 1916.

GILBERT T. WALKER,
Director General of Observatories.

G. M. Press, Simla.—No. 1DGofO.—28-9-16—290—M.D.

DIAGRAM SHOWING GROWTH IN DEPARTMENTAL ACTIVITY AND CHANGES IN TOTAL COST



REPORT ON THE ADMINISTRATION OF THE METEOROLOGICAL DEPARTMENT OF THE GOVERNMENT OF INDIA IN 1917-18.

CHANGES IN THE STAFF DURING THE YEAR 1917-18.

The services of Dr. G. C. Simpson were placed at the disposal of the Indian Munitions Board from the 25th April 1917. He is still working there and Mr. W. A. Bion is appointed as sub. *pro tempore* Imperial Meteorologist in his place.

Mr. C. W. B. Normand was appointed to the Indian Army Reserve of Officers from the 29th February 1916, and was sent by the Army Department on the 18th June 1916 to Mesopotamia to work there as Meteorologist. He is still on this duty. Mr. M. G. Subrahmanyam, Head Clerk, Bombay Meteorological Office, has been acting for him from the 1st February 1918.

Mr. W. A. Harwood, who was appointed to the Indian Army Reserve of Officers from the 10th February 1916, is still away on military duty.

Mr. C. W. Peake, Meteorologist, Calcutta, has been on combined leave since the 9th May 1917. Mr. D. B. Meek, Professor at the Presidency College, Calcutta, is acting for him.

Mr. J. Evershed was on privilege leave from the 12th December 1917 to the 11th January 1918.

The services of Dr. T. Royds were placed at the disposal of the Army Department for employment in the Office of the Director of Ordnance Factories, Calcutta, from the 24th October 1917. He is still there and Mr. S. Sitarama Aiyar is appointed as sub. *pro tempore* Assistant Director of the Kodaikanal Observatory in his place.

OBSERVATORIES.

2. The observatories maintained by the Government of India are classified as follows :—

First Class.—Observatories which are furnished with autographic instruments for continuously recording pressure, temperature, humidity, and wind direction and velocity, in addition to instruments read by eye.

Second Class.—Observatories at which readings are taken daily at 8 hrs., 10 hrs., and 16 hrs.; those at 8 hrs., are (with a few exceptions) transmitted by telegram to one or more of the offices at Simla, Calcutta, Bombay, and Madras for inclusion in India or Provincial Daily Weather Reports.

Third Class.—Observatories—

(*a*) where readings are taken daily at 8 hrs. only; at those stations where there are telegraph offices the observations are transmitted by telegram for inclusion in the Simla, Calcutta, Bombay or Madras Daily Weather Reports ;

(*b*) at stations where there are no telegraph offices, and observations are recorded at 10 hrs. and 16 hrs. only ; these are included in the Monthly Weather Reviews, and furnish a series of observations for the determination of monthly and daily means which should be comparable with the means already obtained for second class observatories.

Fourth Class.—Observatories at which observations of temperature, wind and rainfall only, or of temperature and rainfall only are recorded.

Fifth Class.—Observatories which telegraph rainfall only.

3. At the end of the year the total number of observatories was 273, of which 41 were non-departmental and 232 were maintained by the Government of India. Of the 232 departmental observatories 5 were first class, 181 third class, 23 fourth class, and 23 fifth class.

4. The changes in the observatories during the year were the following :—

The observer's work at Pasni was so bad that the third class observatory there had to be closed from the 19th July 1917 to the 11th October 1917 until another man could be appointed. The second class observatories at Kalabagh and Sarain on the Chur Peak were closed from the 1st December 1917. The third class observatory at Baghdad was re-opened on the 4th January 1918.

First Class Observatories.

5. The Directors of the observatories of Kodaikanal, Madras and Bombay publish separate annual reports which are forwarded for the information of Government. It has accordingly been ruled as unnecessary to include information relating to the working of these observatories in this Administration Report.

6. *Alipore Observatory.*—This observatory is under the charge of the Meteorologist, Calcutta. The following special instruments were in use during the year :—

A Bergholz barograph, a Dines' microbarograph, a Kew thermograph, a Beckley anemograph, a Dines' pressure tube anemometer, Beckley, Hellman-Fuess and monthly rain-gauges, two Omori-Ewing seismographs, grass and ground thermometers, and a nephoscope. The Kew barograph and the Richard thermograph were put out of use from the 2nd August and the 6th November 1917 respectivly.

All instruments issued by the Meteorological Department are tested at this observatory and their corrections ascertained before they are sent out for use. The number of instruments tested and verified during the year was 1,470 as compared with 1,311 last year : 32 instruments were condemned as unfit for issue, or were sent to the India Office for repair and 5 instruments were kept in store for future treatment. In addition to the above, 196 instruments were examined and issued to other observatories.

The observatory gives mean Calcutta time to the port and shipping. Three time-balls are dropped daily at 1 p.m., local mean time throughout the year, one on the Semaphore Tower at Fort William, the second at the Port Commissioners' office and the third at the Kidderpore Docks. This work was carried out quite satisfactorily as far as this department is concerned. There were 34 failures, as compared with 17·3, the average number of the past 29 years ; all these were due to defects in the electric or mechanical arrangements outside the observatory, for which this department is not responsible.

Year.	Number of days on which one or other ball failed to drop properly.	Number of failures due to telegraphic defects.
1917-18	34	34
1916-17	56	41
1915-16	17	17
1914-15	24	24
1913-14	36	36
1912-13	50	50

7. *Lahore Observatory*—The following special instruments were in use during the year :—

A Draper barograph, a Casella rain-gauge, a Beckley anemograph, a sunshine recorder, grass and ground thermometers, and a nephoscope. The Richard barograph was put out of use from the 5th November 1917.

Eye observations of the ordinary meteorological instruments were taken seven times daily at this observatory as in past years at 6, 8, 10, 14, 16, 18, and 22 hours. Ground surface temperature was recorded four times daily at 6, 8, 10, 16 and 22 hours. Cloud observations were taken daily by nephoscope at 8, 12 and 16 hours for use at the Aerological Observatory, Agra.

Character of the work of Observation at second and third class observatories.

8. The general character of the work of the observatories, as judged by the number of mistakes made by observers, was satisfactory.

The number of stations of great reliability, in which either no mistake or only one mistake has been detected in the data for the Indian Daily Weather Report, was 33 as against 21 in 1916-17; while the number of stations at which more than 50 mistakes were made was 3 as against 8 last year.

The usual list showing the number of mistakes in observation and in the preparation of telegrams for all the observatories which send weather telegrams to the Simla office was prepared and circulated to the observatories on the 7th June 1918.

Inspection of Observatories.

9. The number of visits paid to observatories during the year under review was 44 as compared with 52 in the previous year and an average of 54 during the past 10 years.

The Director-General inspected the observatories at Bombay and Agra. Mr. W. A. Bion inspected 6, Mr. P. K. Ghose 27, Mr. M. G. Subrahmanyam 1, and Mr. Budha Mall 8.

Of the 42 third class observatories that were visited 27 were reported as good, 11 as tolerable and 4 as bad.

Condition.	Second or third class observatories inspected in —					
	1917-18.	1916-17.	1915-16.	1914-15.	1913-14.	1912-13.
Good or satisfactory	27	33	24	52	34	31
Tolerable	11	7	10	14	23	17
Bad	4	..	..	3	6	3
Total ..	42	40	34	69	63	51

In estimating the general character of the observatories from the above table it must be remembered that it is, as a rule, on account of something unsatisfactory that a visit of inspection is made. The general level of the stations is thus decidedly better than might otherwise appear. The most frequent cause of bad work is the changing of observers at short intervals necessitated by acting and other arrangements in the Medical, Telegraphic and Postal Departments.

Special Observations.

10. Observations other than those recorded at regular intervals are made as follows:—

(*a*) In accordance with orders issued from the Simla or Calcutta Office, when weather is disturbed and storm warnings may have to be issued: such observations are reported by telegraph. Certain observers at coast observatories are in receipt of a regular monthly allowance of Rs. 5 for sending special storm warning telegrams, while other observers receive an allowance of Re. 1 for each set of special observations sent under instructions from either Simla or Calcutta. The total number of telegrams forwarded during the year under review was 1,878 compared with 1,532 during the previous year.

(*b*) Certain observers, when they consider that conditions at sea are sufficiently threatening, send of their own initiative to Simla or Calcutta a telegram containing special observations. Six such telegrams were received.

(*c*) In connection with flood warning a number of observers have been instructed to send telegrams announcing the occurrence of heavy rainfall to Government officers and certain railway engineers who desire early information. The number of telegrams so sent was 275 as compared with 220 last year.

(*d*) Observers are instructed to send detailed information of earthquakes to the Simla Meteorological Office and to the Director, Geological Survey, Calcutta; for this work they are paid awards from this department. Of such reports 83 were received during this year.

Observations with special Meteorological Instruments.

11. The following special observations were carried out during the past year at certain selected stations:—

1st.—Wind observations recorded by Beckley anemographs at 8 stations, and by Dines' pressure tube anemometers at 4 stations.

2nd.—Solar and terrestrial radiation observations at 1 and 8 stations, respectively.

3rd.—Underground temperature observations at 2 stations.

4th.—Sunshine observations at 6 stations.

5th.—Barometric observations recorded by self-registering instruments, chiefly Richard barographs, at 18 stations.

6th.—Temperature observations recorded by self-registering instruments, chiefly Richard thermographs, at 9 stations.

Observations of Solar Energy in absolute units.

12. Observations at Simla by means of Angstrom's electric pyrheliometer continued in abeyance owing to shortness of staff.

Upper Air Examination.

13. Work with pilot balloons was continued throughout 1917-18 at the same stations as previously, Agra, Simla, Kojak, and Bangalore; and it was started at Lahore on the 20th March, 1918. The results were treated as before, and for the series of years now available at each place most of the figures of half monthly and monthly vector resultants have been plotted to show the resultant trajectories of the period. The variations of corresponding periods from year to year are thus recognizable, for association with the variations in weather.

The series of balloons carrying recording instruments was continued at Agra.

Publication of observations and results is deferred in accordance with the general policy of Government in war time.

A year's series of air temperature observations under the normal Indian thatched thermometer shed and with two other methods of exposure, namely under a tiled shed and in a Stevenson screen, was completed. The object was to ascertain what differences in results, if any, would be involved by the adoption of the less inflammable shed for general use in India, and to estimate the divergence of temperature between the standard Stevenson screen exposure of thermometers at fourth class stations in India and that in the standard thatched shed of other Indian stations. Examination of the results shows appreciable divergences, and has raised questions which need further observations to answer. A second year's observations have therefore been started with certain modifications and additions. These include the use of a third shed, tiled and lined with wood, and the use of a motor-ventilated open-air exposure of maximum and minimum thermometers, shielded from external radiation in Assmann jacket tubes. A number of important results are indicated but the examination of these is not yet completed.

Researches by the Simla Staff.

14. Owing to the absence on war work of Simla gazetted officers the only researchs found possible have been statistical examinations of various types. These are shortly stated in section 33 below.

Seismograph Observations.

15. Seismological observations were recorded throughout the year by two Omori-Ewing seismographs at Simla and at Calcutta and one at Bombay; by Milne seismographs at Kodaikanal and Colaba (Bombay); and by means of other self-registering instruments at the last-named station. All the instruments worked satisfactorily throughout the year, and data were transmitted to the Seismological Committee of the British Association.

Marine Meteorology.

16. No change was made during the year in the method of collecting marine information.

At Calcutta and Bombay a clerk at each port spends his whole time in visiting ships, making in each case a copy of the log and a comparison of the ship's barometer with a secondary standard, for the purpose of applying the necessary corrections to the readings in the logs; and, after the barometer comparisons have been made, a statement of the error of the ship's barometer is given to the captain, in case he should desire to make use of it. The number of ships visited is materially less than that of the vessels which come into port, but it is ample for the purposes of the department.

The data thus obtained are utilised in the preparation of charts of disturbances in the Bay of Bengal and the Arabian Sea for future reference in connection with the storm warning work of the department, and in drawing up an account of the storms of the year for publication in the Annual Summary.

The arrangement made with Royal Alfred Observatory at Mauritius, for collecting marine data from the Indian Ocean, has been continued, and the thanks of this department are again due to that office for thus supplying a large amount of useful data. No such data were received from the London Meteorological Office during the year.

Snowfall Registration in the mountain districts to the north and west of India.

17. The information as to the amount, distribution and time of occurrence of the snowfall in the Himalayan and Afghan mountain areas was on the whole tolerably complete, and the thanks of the department are again due to the various officers who have collected and forwarded it. Unfortunately the series of large-scale photographs of the snows, as seen from Simla, which was started in 1905, has had to be discontinued during the war.

Rainfall Registration.

18. The registration of rainfall in India has invariably been carried out by the provincial authorities. In 1889 a uniform system was introduced by the Government of India, and the Director-General of Observatories was made consulting officer in connection with this work. His advice is sought regarding the starting of new rain-gauge stations, and he receives annual reports from the local officers responsible for the registration of rainfall upon the efficiency of the work. A general account of the system, which came into operation in the year 1891-92, will be found on pages 5—8 of the Administration Report of the year 1889-90, and on pages 6 and 7 of the Administration Report for the year 1890-91.

The following is a statement of the number of rain-gauge stations from which data were received for publication in the Rainfall Data of India at the end of the year :—

Province or Division.	Number of rain-gauges supplying returns for publication on 31st March 1918.	Province or Division.	Number of rain-gauges supplying returns for publication on 31st March 1918.
Burma	213	Baluchistan	90
Assam	125	Rajputana	186
Bengal	230	Bombay and Sind	289
Bihar and Orissa	300	Central India	122
United Provinces	275	Central Provinces and Berar ..	189
Punjab	190	Hyderabad	19
Kashmir	39	Mysore	77
North-West Frontier Province ..	36	Madras (including Pudukkottai, Coorg, Travancore and Cochin).	525

The following paragraphs give a brief summary of the reports of the officers in charge of rainfall registration for the year 1917-18 :—

Assam.—The number of gauges inspected was 56 or 34 less than in the previous year, and the total number of inspections was 82 against 144 the previous year. Nineteen rain-gauges were inspected more than once.

Baluchistan.—Only 14 stations were inspected.

Bihar and Orissa.—Here out of 300 stations 183 stations were inspected and 219 inspection cards were received against 205 last year. On the whole the rainfall registration work was satisfactory.

Bengal.—Of the 230 rain-recording stations in the Province 40 stations were inspected as against 56 in the previous year.

Bombay and Sind.—Out of 278 rain-gauges in British districts 206 were inspected, 89 being inspected more than once. The total number of inspections was 304. In Native States, 40 gauges were inspected out of 61 : the total number of inspections was 48.

Burma.—Of 212 rain stations 18 were meteorological observatories, 25 were in charge of the Public Works Department, 2 in charge of the Agricultural Department and the rest were under District Officers. Of the rain-gauges, 152 were inspected : 117 were in good order, 29 were in fair condition, and 6 were unsatisfactory.

Central Provinces.—There were 175 inspections against 154 the previous year. The results attained during the year show that the work of registration is carried out with efficiency.

Berar.—The number of inspections of the 43 rain-gauges was 103 against 161 in the previous year.

Hyderabad.—The rainfall registering stations of Hyderabad are in charge of the Nizam's Public Works Department. There are 17 stations, of which 11 were inspected during the year. In addition there is a rain-gauge in charge of the Residency Surgeon and one at Bolaram in charge of the Senior Medical Officer.

Kashmir.—There were 38 rain-gauges in this State, of which 8 are meteorological observatories and the remainder are in charge of the Revenue Department.

Fourteen rain-gauges were inspected as against five last year.

Madras.—Out of 496 rain-recording stations 395 were in the Madras Presidency, and of these the number inspected was 390.

Mysore.—At the close of the calendar year 1917, the number of rain-recording stations was 226 against 224 the previous year : of these 201 were inspected against 213 inspected last year.

North-West Frontier Province.—The report on rainfall registration contained in the current administration report of land revenue, land records and agriculture of this province refers to the year 1916-17 and states that there was no change in the situation of the rain-gauges. These and the rainfall registers are generally reported to be in good order and properly maintained.

Punjab.—The number of rain-gauges in the Punjab was 243, of which 149, are in charge of district officers and 97 in charge of irrigation officers. There were 43 inspections of the district rain-gauges. Those under irrigation officers were regularly inspected.

Rajputana and Ajmer-Merwara.—During the triennial period ending the 31st March 1916, there were 414 rain-gauges, of which most were inspected during the period under review. Out of 18 rain-gauges in Kotah 13 were inspected, and none of the 14 gauges in Dholpur were inspected

United Provinces.—Out of 271 stations under district and canal officers, 51 per cent. were inspected as compared with 56 per cent. last year.

Summary.—In the Central Provinces, Berar, Madras, and Mysore, the proportion of the rainfall stations inspected was over 75 per cent., which is satisfactory. In Assam, Bihar and Orissa, Burma, Hyderabad and the United Provinces, where between 50 and 75 per cent. of gauges were inspected, the efficiency of the system must suffer before long. But the proportions in the remaining provinces — Bombay 46 per cent., Kashmir 37 per cent., Punjab 28 per cent., Baluchistan 18 per cent., and Bengal 17 per cent — are such as to call for serious attention.

The System for Storm Warning.

19. The work of warning Indian ports of the approach of cyclonic storms or of bad weather is performed from the Simla Office by the Director-General of Observatories, and from the Calcutta Office by the Meteorologist, Calcutta.

The following ports are warned from Simla for storms in the Arabian Sea :—

Aden, Karachi, Cutch Mandvi, Jamnagar, Dwarka, Porbandar, Veraval, Jafarabad, Bhavnagar, Daman, Bombay, Alibagh, Murud Janjira, Harnai, Ratnagiri, Malvan, Vengurla, Nova Goa, Marmagao, Karwar, Kumta, Honavar, Mangalore, Tellicherry, Calicut, Cochin, Alleppy, Quilon, Trivandrum, Colachel, Busra, and Colombo.

The Meteorologist, Calcutta, warns the following ports for storms in the Bay of Bengal :—

Colombo, Tuticorin, Pamban, Negapatam, Porto Novo, Cuddalore, Madras, Masulipatam, Cocanada, Vizagapatam, Calingapatam, Gopalpur, Puri, Hukitala (False Point), Chandbali, Sandheads, Saugor Island, Diamond Harbour, Mud Point, Budge Budge, Calcutta, Khulna, Barisal, Goalundo, Narayanganj, Chandpur, Noakhali, Chittagong, Cox's Bazar, Akyab, Kyaukpyu, Diamond Island, Bassein, Rangoon, Elephant Point, Moulmein, Tavoy, Mergui, Table Island (reopened on 15th August 1916), and Port Blair.

The following River Police stations in Eastern Bengal and Sunderbans are also warned :—

Nikli, Bhairab, Chandpur, Mirzaganj, Narayanganj, Madaripur, Gopalganj, Godarhadi, Goalundo, Aralia, Sirajgang, Lohajang, Sara, Godagari, Rampur Boalia and Khoksa.

20. In addition to special messages sent during stormy weather the Meteorologist, Calcutta, provides shipping with daily information regarding the weather over the Bay. The following ports receive daily telegrams under the "General system with additional signals" :—

(1) Table Island.
(2) Elephant Point.
(3) Diamond Island.
(4) Akyab.
(5) Chittagong.
(6) Negapatam.
(7) Cocanada.
(8) Madras.
(9) Cuddalore.
(10) Porto Novo.
(11) Bassein
(12) Rangoon.
(13) Saugor Island.
(14) Sandheads.

Note.—Ports (1) to (12) however receive no telegrams during the period 15th January to 31st March. On the 15th January a telegram is sent to these ports saying the Ball indicating fine weather should remain suspended until further orders. At the Sandheads signals are not exhibited, but information is available for passing vessels.

21. In accordance with resolutions passed at the International Radio-Telegraph Conference held in London in June and July 1912, the Indian Radio-Telegraph coast stations are now supplied with telegrams containing meteorological information with regard to the Arabian Sea and the Bay of Bengal. The messages are sent to the radio stations at Bombay, Karachi, Calcutta, Rangoon, Madras, and Port Blair for broadcast transmission by wireless to the shipping in the Arabian Sea and the Bay of Bengal.

Arrangements made for the receipt by wireless telegraphy of meteorological observations from ships at sea worked satisfactorily up to August 1914, when owing to the outbreak of the war these wireless telegrams had to be discontinued.

Warnings for storms in the Bay of Bengal.

22. During the year warnings were issued for nineteen disturbances. Three of these developed into storms of some severity, and regarding the two most important a detailed statement is given here of their course and of the action taken.

Storm of 30th April—3rd May 1917.

A depression began to form in the south of the Bay on the 30th April. At 8 hrs. on the 1st May it was still without any definite centre, but was lying about 300 or 400 miles to the east of Negapatam. During the next 24 hours it developed into a storm, and moved in a northerly direction to a position about 400 miles east of Nellore. It then travelled with unusual rapidity and was about 75 miles east of False Point by 8 hours of the 3rd, crossing the coast the same afternoon between Balasore and Saugor Island.

The ports which were likely to be affected or from which vessels might run into the storm were informed daily from the 1st May of the progress of the storm, so far as was ascertained from the coast observations, and signals were hoisted. The action taken with regard to Saugor Island and Balasore is shown by the following telegrams :—

Saugor Island.

1st May at 10 hrs. 45 mins. Hoist distant cautionary (*a*) section four.* Weather suspicious off south Madras coast.

2nd May at 11 hrs. 8 mins. Hoist distant warning (*b*) sections four five.* Storm position doubtful roughly four hundred miles east Negapatam. Track uncertain.

3rd May at 8 hrs. 15 mins. Hoist distant warning (*b*) sections two three.* Storm reached north Bay moving some northerly direction will wire later approximate position centre.

3rd May at 9 hrs. 17 mins. Hoist danger signal number seven (*d*).

3rd May at 20 hrs. Lower storm signal hoist ball (*f*). Storm now inland.

Balasore.

3rd May at 9 hrs. 22 mins. Hoist great danger signal (*e*). Severe storm may strike you almost at once.

3rd May at 18 hrs. Lower storm signal. Storm crossing coast near Saugor Island.

As Balasore possessed only the brief system of signals it was not necessary to hoist any signal there until the port was threatened. The actual notice given was rather short as the position of the storm was not realised until the morning of the 3rd.

Storm of 24th—30th October 1917.

A storm was forming near the Andamans on the 24th October. It developed and moved in a north-westerly direction until the morning of the 28th, when it was about 150 miles south-east of Gopalpur; it then took a northerly course and was close to the coast off Gopalpur on the morning of the 29th. After this it travelled along the coast and was to the north of Calcutta on the evening of the 30th.

The ports which were likely to be affected or from which vessels might run into the storm were informed daily from the 25th of the progress of the storm, and signals were hoisted. The action taken with regard to Hukitala, Diamond Harbour and Calcutta is shown by the following telegrams :—

Hukitala (False Point).

25th October at 11 hrs. 22 mins. Hoist distant cautionary (*a*). Weather disturbed north-west Port Blair two hundred miles.

26th October at 10 hrs. 37 mins. Weather disturbed two hundred miles west-south-west Diamond Island.

27th October at 11 hrs. 8 mins. Weather disturbed centre Bay between Waltair and Diamond Island.

27th October at 21 hrs. 41 mins. Hoist local cautionary (*c*). Moderate storm two hundred miles off Calingapatam approaching coast.

28th October at 11 hrs. 35 mins. Moderate storm two hundred miles off coast latitude nineteen.

29th October at 11 hrs. 12 mins. Moderate storm on coast near Gopalpur. Weather squally Orissa coast and north-west angle Bay.

30th October at 13 hrs. 2 mins. Lower storm signal. Storm north-west Balasore moving north-east weather still squally north-west angle Bay.

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*Refers to the sections of the Bay which were affected.

(*a*) Indicating that there was a region of squally weather in which a storm might be forming.

(*b*) Indicating that a storm had formed.

(*c*) Indicating that the port was threatened by squally weather.

(*d*) Indicating that the port would experience severe weather from a storm of slight or moderate intensity that was expected to cross over or near to the port.

(*e*) Indicating that the port would experience severe weather from a storm of great intensity that was expected to cross over or near to the port.

(*f*) Indicating fine weather.

Diamond Harbour.

*25th October at 11 hrs. 19 mins. Hoist distant cautionary (*a*). Weather disturbed north-west Port Blair two hundred miles.

26th October at 10 hrs. 46 mins. Weather disturbed two hundred miles west-south-west Diamond Island.

27th October at 11 hrs. 2 mins. Weather disturbed centre Bay between Waltair and Diamond Island.

*27th October at 22 hrs. 14 mins. Hoist distant warning (*b*). Moderate storm two hundred miles off Calingapatam.

28th October at 11 hrs. 32 mins. Moderate storm two hundred miles off coast latitude nineteen.

*29th October at 11 hrs. 15 mins. Moderate storm on coast near Gopalpur. Weather squally Orissa coast and north-west angle Bay.

*29th October at 12 hrs. 40 mins. Hoist local cautionary (*c*).

30th October at 13 hrs. 5 mins. Storm fifty miles north-west Balasore moving north-east. Weather squally north-west angle Bay.

*30th October at 21 hrs. 10 mins. Lower storm signal. Storm slightly north-west Calcutta moving east-north-easterly giving heavy rain.

Calcutta.

The telegrams sent to Calcutta were those shown under Diamond Harbour with an asterisk.

It appears that although the position of the storm was correctly indicated to the ports affected, the signals did not very adequately convey the degree of danger. At Hukitala for instance only 'cautionary' signals, indicating squally weather, were hoisted, but not 'danger' signals to indicate the admitted existence of a 'moderate storm.' At Calcutta and Diamond Harbour the local danger signals should have been hoisted. Fortunately however although winds at sea were fairly strong those on shore were quite feeble and probably no harm was done.

STORM OF 29TH SEPTEMBER—2ND OCTOBER 1917.

This storm was of slight intensity and affected a comparatively small area. The signals hoisted gave adequate warning to the ports concerned.

WARNING FOR STORMS IN THE ARABIAN SEA DURING THE YEAR.

23. The Simla Office warns the west coast ports, not only for storms, but also for squally weather, especially at the beginning of the monsoon. There were eleven periods of disturbed weather in the Arabian Sea for which warnings were issued, but only two of these disturbances developed into storms.

The first formed during the advance of the monsoon which occurred at the Malabar coast near the end of May. Signals were hoisted at the ports telling of the likelihood of squally weather on the 25th, and were lowered on the 26th as the disturbance receded from the coast. In the meantime a severe storm had formed, probably in the west of the Arabian Sea, which was encountered by the S.S. "Portsea" on the 25th-26th May in the neighbourhood of the Kuria Maria Island. No further signals were hoisted as the storm formed too far from our west coast stations to affect their observations.

STORM OF 18TH—25TH OCTOBER 1917.

A storm of moderate severity formed off Malabar on the 18th and 19th October and travelled in a northerly direction. It struck the Kathiawar coast near Porbandar at noon on the 25th.

The ports which were likely to be affected or from which ships might run into the storm were informed daily from the 18th of the development and movement of the storm, and the appropriate signals were hoisted. As the storm was

(*a*) Indicating that there was a region of squally weather in which a storm might be forming.
(*b*) Indicating that a storm had formed.
(*c*) Indicating that the port was threatened by squally weather.

during the greater part of its existence at a considerable distance from the coast the observations at the coast stations did not give any clear indication of either its position or character. The action taken is shown by the following telegrams sent to Veraval, Porbandar and Dwarka :—

18th October at 11 hrs. 52 mins. Disturbed conditions off Malabar coast. Hoist signal number one distant cautionary (*a*).

19th October at 12 hrs. 4 mins. Conditions are still disturbed south-east Arabian Sea.

20th October at 11 hrs. 53 mins. Storm probably forming fourteen degrees north sixty-eight east.

20th October at 22 hrs. 24 mins. Indications of disturbance fainter perhaps moving west.

21st October at 11 hrs. 55 mins. Disturbance apparently unchanged.

21st October at 22 hrs. 2 mins. Disturbance apparently unchanged.

22nd October at 11 hrs. 56 mins. Disturbance still appears about sixteen north sixty-eight east.

22nd October at 21 hrs. 56 mins. Depression probably giving disturbed weather south-east Arabian Sea.

23rd October at 12 hrs. 39 mins. Replace signal number one distant cautionary (*a*) by signal number three local cautionary (*c*). Storm probably forming seventeen north sixty-eight east may give rough weather your port.

23rd October at 18 hrs. 24 mins. Storm probably formed about eighteen north sixty-seven east. Replace signal number three local cautionary (*c*) by signal number four local warning (*g*).

23rd October at 23 hrs. Observations indicate very little change in storm.

24th October at 11 hrs. 55 mins. Replace signal number four warning (*g*) by number seven danger (*d*). Storm two hundred miles off Veraval threatens your port.

24th October at 16 hrs. 46 mins. Storm hundred fifty miles south-west of Veraval moving north or north-east.

24th October at 23 hrs. 7 mins. Storm now about hundred miles south-west of Veraval moving northwards perhaps weakening will probably cross coast near Porbandar noon tomorrow Thursday.

25th October at 5 hrs. 7 mins. Storm still moving very slowly northwards.

25th October at 11 hrs. 42 mins. Storm of moderate severity now crossing inland near Dwarka.

25th October at 16 hrs. 25 mins. Storm passed inland over Porbandar about noon strong winds will persist to-day.

25th October at 22 hrs. 20 mins. Storm slowly weakening inland but still causing rough weather.

26th October at 10 hrs. 54 mins. Storm now in Rajputana lower signal.

Information in connection with the sending of vessels to Mesopotamia.

24. Information regarding weather in the Bay was sent by the Meteorologist, Calcutta, to the Captain Superintendent, Royal Indian Marine Dockyard, Calcutta, and the Principal Port Officer, Rangoon, in connection with the towage of vessels intended for Mesopotamia. Corresponding information regarding the Arabian Sea was sent by Simla to the Director of Indian Marine, Bombay, the Port Officer, Pamban, and the Naval Intelligence Officer, Colombo.

(*a*) Indicating that there was a region of squally weather in which a storm might be forming.
(*c*) Indicating that the port was threatened by squally weather.
(*d*) Indicating that the port would experience severe weather from a storm of slight or moderate intensity that was expected to cross over or near to the port.
(*g*) Indicating that the port was threatened by a storm but that it did not yet appear that the danger was sufficiently great to justify extreme measures of precaution.

Flood Warning and Weather Forecasts to District, Irrigation, Railway and other Officers.

25. This work is carried out chiefly by the Simla Meteorological Office, and partly by that of Calcutta. The arrangements have been made at various times and differ considerably in character, according to the nature and extent of the flood or weather warnings required by the officers concerned. In most cases these officers require telegrams either warning them of advancing storms likely to give heavy rain, or informing them of the actual occurrence of heavy rainfall likely to give rise to severe floods which might injure railways or canal works; and in other cases they require warnings or forecasts of the weather for as long a period beforehand as possible.

The number of district officers and officers in the irrigation, telegraph, railway and other departments requiring flood warnings from Simla amounted at the end of the year to 206, as compared with 201 in the previous year. There were also 5 officers of the Telegraph Department who required warnings for strong winds.

This number does not include captains of mail steamers and other vessels who occasionally telegraph from Karachi, Aden and other ports for the latest intelligence respecting the position and movement of cyclonic storms, nor does it include the names of other individuals or firms who ask for special forecasts.

The number of warning messages sent from Simla during the year 1917-18 was 5,789 as compared with 4,879 in 1916-17 and 2,838 in 1915-16. In addition to these there were 26 warnings for strong winds sent to officers of the Telegraph Department.

The number of warnings for heavy rainfall and strong winds sent from Calcutta during the year 1917-18 was 1,100 and for only strong winds 255, thus making a total of 1,355, as compared with 607 in 1916-17.

26. Instructions were issued by the Government of India in 1898 that every officer to whom storm or flood warnings are issued should in the month of January of each year or, in the case of military expeditions, at the close of the campaign, forward to the head of this department a brief return of the warnings received and should also report—

(1) whether the warning telegrams were rapidly transmitted and delivered by the Telegraph Department;

(2) whether the warnings were timely and satisfactory in every respect and, if not, in what points they were defective;

(3) whether any changes might be made in the system which would make the warnings more useful.

Reports on the ordinary storm and flood warnings for the calendar year 1917 were received from 43 officers. Of these 34 stated that the warnings were satisfactory, but there were frequent delays in transmission in the case of warnings sent to Orissa, probably owing to interruptions on the line. One officer stated that the warnings arrive rather late and 8 offered no remarks.

A comparison of the reports of floods and of heavy rain with information supplied to the various officers would appear to show that the system is working satisfactorily, and that most of the warnings issued were of value to the recipients. As an illustration the following note may be of interest. It formed part of the report submitted by the Executive Engineer, Rupar Division, Sirhind Canal:—

> "I may specially note that the storm telegram gave us timely warning of the approach of the abnormal and very heavy monsoon storm at the end of October, and the canal was consequently closed in good time in anticipation of nil indents, which was very beneficial for all concerned."

Seasonal Forecasts.

27. The forecast for the monsoon period of 1917, dated the 6th June, was sent to Local Governments and Administrations, communicated to the press, and printed in the Gazette. A statement of the rainfall of June and July with a forecast for

August and September was drawn up on the 7th August 1917 and published in a similar manner.

A statement of the actual rainfall during the monsoon period and a comparison of the two forecasts with actual rainfall was drawn up on the 1st January 1918 and sent to Local Governments and Administrations.

The following are summaries of these two forecasts and comparison of them with the actual rainfall :—

Forecast dated the 6th June 1917.	Remarks.
(*a*) The outlook for the general monsoon rainfall of India is on the whole favourable, and the rainfall is likely to be in excess, at any rate in the earlier part of the season.	The general monsoon rainfall was in excess by slightly over seven inches, or twenty per cent. and the total for each half of the season was in excess.
(*b*) In spite of the recent cold, there is no reason to expect that the rainfall of north-west India will suffer to any marked extent by comparison with that of the rest of India.	The percentage excesses of the provinces of north-west India were : United Provin ces 22, Punjab 92, Kashmir 53, North-West Frontier Province 64, Sind 114, Rajputana 103, Central India West 35, and Gujarat 28. It will be seen therefore that the rainfall of north-west India was far from suffering by comparison with that of the rest of India.

Forecast dated the 7th August 1917.	Remarks.
(*a*) The total rainfall of August and September is likely to be in excess.	The rainfall of the period was in excess by 5·7 inches or 34 per cent.
(*b*) The indications regarding the geographical distribution are not sufficiently strongly developed to be reliable. They merely suggest that the United Provinces West and neighbouring districts may fare better than the rest of India in the ratio of the actual to the normal rainfall.	The percentage excesses of the districts in question were :—United Provinces West 33, United Provinces East 17, Central India West 49, Rajputana East 138, Punjab East and North 130.

Both in June and August the anticipations of a general excess of rainfall were justified.

Regarding the geographical distribution reasons were given in June for expecting that both the Arabian Sea and the Bay monsoon currents would be stronger than usual, as well as that there would be no prejudicial effect of snowfall in north-west India. These expectations were fulfilled.

In the forecast for August and September the uncertain indications that the area about the United Provinces West would get a larger percentage rainfall than the rest of India proved correct. The average of the percentage excesses of the five divisions given above is 73, while that of the whole of India was 34.

28. A forecast of the probable character of the rains during January and February 1918 was prepared on the 2nd January 1918 and issued in the same manner as the forecast of the previous June. On the 3rd July 1918 a comparison of the actual precipitation with the above forecast was issued. The summary of the forecast issued was :—

> "It is probable that the total amount of rainfall in north-west India and of snowfall on the neighbouring hills in January and February will be normal or in moderate excess."

The total amounts both of rainfall and snowfall during January and February were however decidedly less than usual and that the forecast was definitely wrong

Daily Telegraphic Weather Summary.

29. The summary was despatched daily at about noon. It was exhibited at certain telegraph offices and sent to 82 officers of Government. The subscribers for longer or shorter periods were 10 newspapers and 42 private individuals. To officers in Simla sheets containing the summary with a chart showing the rainfall of the day are distributed by hand.

Publications.

30. There were no changes made during the year in the form of the routine publications of the department of which a description will be found in the departmental administration reports of 1907-08 and 1910-11 : but in view of the shortage of paper the publication of the Monthly Weather Review had been stopped after the number for October 1916 and the publication of the Annual Summary after that for 1915. The monthly and annual supplements to the Indian Daily Weather Report have been printed as usual, and supply the general need for prompt information.

Supply of Meteorological Information.

31. In addition to the meteorological information published by the department special information was supplied to the Meteorological Departments of England, Australia and Egypt.

Climatological information, at times involving special calculation, is also provided for sanitary and other officers of Government, as well as for private firms who are willing to pay the expense necessarily incurred. The extent to which the department is utilised in this manner will be seen from the chart appended.

Miscellaneous.

32. Four hundred and eleven books and pamphlets, either purchased or presented by scientific bodies, were added to the library during the year, as against three hundred and thirty-two in the year 1916-17.

Eight libraries, observatories or societies were added during the year to the list of institutions to which the publications of the Indian Meteorological Department are supplied, and one was removed ; the number on the list is now 370.

Chief Features of the Year.

33. At the beginning of the year Dr. Simpson, Imperial Meteorologist, left the Simla office to become Assistant Secretary to the Board of Munitions during the war ; and as the Simla office had already lost the services of Mr. Normand, who had been appointed meteorologist with the forces in Mesopotamia, its scientific activities were inevitably diminished.

Use was however made of the computing staff to compute, statistica methods, a number of correlation coefficients bearing on the distribution of monsoon rainfall, as well as others dealing with sanitary and economical questions.

At the Solar Physics Observatory, Kodaikanal, also the staff was materially reduced ; Dr. Royds, the Assistant Director, joined the Indian Army Reserve of Officers in October 1917 for ordnance work.

During the year the department has lost the services of Mr. C. W. Peake, Professor in Physics at the Presidency College, Calcutta. He had served as Meteorologist, Calcutta, with much zeal and efficiency since 1906.

The routine work of the department was maintained with but little change except that the publication of the Indian Monthly Weather Review and its Annual Summary was discontinued in view of printing difficulties during the war ; it was considered that the monthly and annual supplements to the Indian Daily Weather Report, which were being maintained, were sufficient for most administrative purposes. Among the weather observing stations the chief event has been the closing of those at Sarain and Kalabagh on the Chur Peak. These had been started by Sir John Eliot as upper air observatories. But general experience has shown that measurements made on mountains differ appreciably

from those in the free air ; also the inaccessibility of the Chur Peak made effective supervision extremely difficult ; hence it became clear that the results were not worth their cost.

There were during the year three storms of importance in the Bay and two in the Arabian Sea : warnings were given to the Indian ports for all except one which was too near Arabia to affect the observatories on our west coast.

CONCLUDING REMARKS.

34. The Meteorological Department owes a large part of its usefulness to the sympathetic assistance it receives from outside departments. Civil Surgeons and other officers of Government departments, as unpaid superintendents of observatories and in other capacities, help in the meteorological work ; the Telegraph and Postal Departments assist in every way in the rapid transmission of meteorological information, at the same time that they allow their employees to act as observers. The Indo-European Telegraph Department, also, by giving free transit to the daily records of the Persian observatories, places a large amount of most useful information at the disposal of the Meteorological Department. Weekly telegrams were received from May to September from the Director of the Royal Alfred Observatory, Mauritius, as well as from the departmental observatories at Zanzibar and Seychelles. These telegrams gave valuable information of the weather conditions in the Indian Ocean and the Department is indebted to the officers indicated for the punctual transmission of the information. Thanks are more specially due to the Director of the Royal Alfred Observatory for his courtesy in placing the meteorological data of that observatory at the disposal of the Indian Meteorological Department.

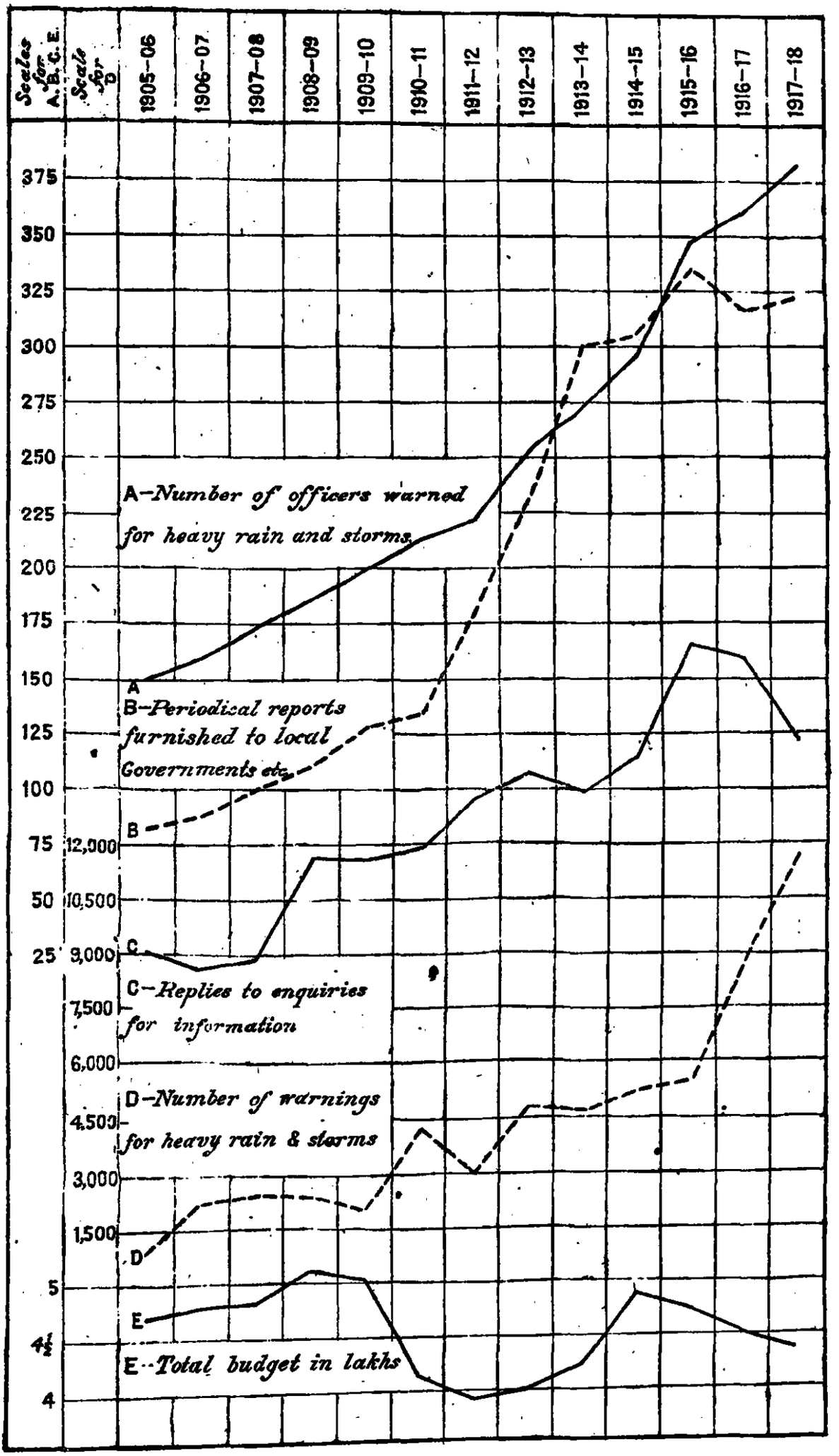
The Department is greatly indebted for important information as to meteorological conditions prevailing antecedent to and during the south-west monsoon to the Director, Physical Service, Survey Department, Cairo ; the Directors of the Observatories at Buenos Ayres and Santiago ; and to the various officers around the Indian frontiers who have collected and supplied valuable snowfall information.

SIMLA : GILBERT T. WALKER,

The 27th September 1918. *Director General of Observatories.*

G. M. Press, Simla.—No. 1D.G.O.—8-10-18—290—E.A.

GROWTH IN DEPARTMENTAL ACTIVITY AND CHANGES IN TOTAL COST



REPORT

ON

ARCHÆOLOGICAL WORK IN BURMA

FOR THE YEAR 1902-03.



RANGOON:

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TABLE OF CONTENTS.

RESOLUTION ON THE REPORT ON ARCHÆOLOGICAL WORK IN BURMA FOR THE YEAR 1902-03.

	Para.	Page.
Arrangement of chapters unsatisfactory	1	1
Principal duties of Government Archæologist	2	*ib.*
Expenditure	3	*ib.*
List of buildings or monuments	4	2
Proposals for conservation of other monuments	5	*ib.*
Improvements to Mandalay Palace	6	*ib.*
Proposed programme suitable	7	*ib.*
Want of an adequate staff	8	*ib.*

FORM A.

LIST OF BUILDINGS OF ARCHÆOLOGICAL, HISTORICAL OR ARCHITECTURAL INTEREST TO BE MAINTAINED BY THE PUBLIC WORKS DEPARTMENT.

REPORT OF THE GOVERNMENT ARCHÆOLOGIST, BURMA, FOR THE YEAR ENDING 31ST MARCH 1903.

	Page.
Carrying out of programme	1 & 2
Work done during the year—	
A.—Office work	3
B.—Archæological finds	*ib.*
C.—Numismatics	*ib.*
D.—Custody of pagodas at Pagan	4
E.—Repair, restoration and maintenance of pagodas and other suitable archæological buildings—	
Syriam, Minbu, Tagaung and Pagan	4—6
Tours of the Government Archæologist	6
Translation	7
Explanatory note	*ib.*
Programme of work for 1903-04	7 & 8

ANNEXURE A.

REPORT BY THE EXECUTIVE ENGINEER, MANDALAY DIVISION, ON THE COVSERVATION OF THE PALACE AT MANDALAY, DATED THE 22ND APRIL 1903.

NOTE BY THE VICEROY ON PUBLIC BUILDINGS (OTHER THAN THE PALACE), MANDALAY.

NOTE ON THE PRESERVATION OF THE MANDALAY PALACE BY MR. J. BENTON, OFFICIATING CHIEF ENGINEER, DATED THE 6TH DECEMBER 1901.

ANNEXURE B.

REPORT ON REPAIRS TO PAGODAS AT PAGAN.

MAP OF PALACE PLATFORM.

RESOLUTION

ON THE

REPORT ON ARCHÆOLOGICAL WORK IN BURMA

FOR THE YEAR 1902-03.

Extract from the Proceedings of the Government of Burma in the Revenue Department, No. 9A.-25, dated the 11th August 1903.

READ—

Report on Archæological work in Burma for the year 1902-03.

RESOLUTION.—The Report on Archæology for the year 1902-03 furnishes some useful information of the work done during the year, but the chapters have not been well arranged so as to show clearly the advance that has been made in each branch of the department, and it is altogether wanting in any satisfactory account of the work of conservation carried on during the year. The Government of India have recently prescribed in full detail the manner in which these reports are in future to be compiled, the main principle being that the record of departmental routine with the accounts of conservation work proposed, carried out, and in progress, and of the expenditure incurred is to be separated from the account of the progress of archæological research. As the present report was before the Lieutenant-Governor when these instructions were received, His Honour has not thought it advisable to delay its submission in order to require the necessary changes to be made in the form of the report. But the information that will now be given in this Resolution will help to explain what is lacking in the Report and the Government Archæologist, to whom the orders of the Government of India are now being communicated, should study them carefully and observe them closely in framing his next report. It is advisable that he should submit for approval in advance an outline of the headings under which he proposes to deal with each of the two branches of the subject.

2. As in the previous year, the Archæologist has devoted a large share of his time to the decipherment of the ancient inscriptions found in different parts of the province. This, no doubt, is useful work, but it is not the most pressing of the Archæologist's duties, nor the first object of his appointment. The Government of India, in a review of Archæological work generally throughout the whole of India, have drawn attention to the importance of an Archæologist's duties in regard to the conservation of ancient monuments and their views on this point should not be lost sight of. They have also in a recent letter No. 2466-70, dated the 14th July 1903, commented on the failure to undertake any works of conservation or repair in Burma as evidenced in the report for 1901-02. This comment is justified by the omission from the report of any account of the work done in that year, but nevertheless, some work was accomplished though it was not very extensive. The inadequate account of the work of the past year that is given in the report now under consideration is likely to give rise to a similar impression that less has been done than is really the case. It seems advisable therefore to fill up the gaps in

both these reports by a brief summary of what has actually been accomplished during the past three years.

3. In the year 1900-01 a sum of Rs. 1,12,964 was spent on the conservation and repair of ancient monuments. This sum was distributed as follows :—

	Rs.
(1) Repairs to *pyatthāts* on walls of Fort Dufferin, Mandalay ...	44
(2) Special repairs to *pyatthats*, Fort Dufferin, Mandalay ...	11,764
(3) Annual repairs to Palace buildings, Mandalay	3,601
(4) Gold leafing or re-gilding the King's throne, &c., Mandalay ...	47,707
(5) Special repairs, to and restoration of, Palace buildings, Mandalay ...	44,165
(6) Gold-leafing tombs of Mindôn Min, Mèdawgyi, and Nanmadawgyi, Mandalay	5,436
(7) Annual repairs to tomb of Shwebo Min, &c., Amarapura ...	147
(8) Annual repairs to tomb of Mindôn Min, Mandalay	100
Total ...	1,12,964

In 1901-02, as the Government of India have remarked, little was done, but although no mention of the expenditure is made in the report of that year the Lieutenant-Governor finds that a sum of Rs. 15,224 was spent on repairs to the Palace at Mandalay, and on the *pyatthats* on the walls of Fort Dufferin. In the year 1902-03, to which the present report refers, Rs. 41,184, has been spent, namely, Rs. 28,970, on works in Mandalay as detailed in the Executive Engineer's memorandum that is enclosed in the Archæologist's report; Rs. 6,995 on the principal pagodas at Pagan as stated on page 5 of the report, while Rs. 703 was spent on the Manuha temple at Pagan; Rs. 1,079 on caretakers for the pagodas at the same place; and a further sum of Rs. 3,900 in ordinary annual repairs to the Palace buildings in Mandalay. In the current year a budget grant of Rs. 86,777, has been sanctioned, of which Rs. 25,000 will be devoted to ordinary repairs in Pagan, Mandalay and elsewhere, a detailed account of which should be given in the next report, while Rs. 35,000 will be devoted to the completion of the missing *pyatthats* on the Fort wall and gateways at Mandalay, and Rs. 5,000 will be given towards the construction of the museum at Pagan, the estimate for which, given in the report, is erroneous. According to the figures now received from the Public Works Department this museum is likely to cost Rs. 13,000 before it is completed.

4. Since the close of the year the Government Archæologist has furnished a list of the buildings or monuments, which are already being maintained and conserved at Government expense. A copy of the list is attached to this Resolution. The list should have been given in the report. On some of these, *viz.*, the Palace and *pyatthats* at Mandalay and the pagodas at Pagan, considerable expenditure as already described has been incurred during the year. It does not, however, appear that anything has been spent upon the repair of the Royal tombs at Mandalay and Amarapura, and the Lieutenant-Governor would have been glad to learn the present condition of all the monuments entered in the list. This information should be given in the next report.

5. Proposals have also been recently submitted by the Government Archæologist for the conservation of certain other monuments, chiefly in the Shwebo and Myingyan districts. Several of these proposals have been adversely criticised by the Deputy Commissioners and Commissioners concerned, and as the Archæologist does not appear to have visited the districts during the year, or to have had the advantage of discussing the projects with the local officers, His Honour thinks

t is advisable to defer orders on the subject until the arrival of the Director-General of Archæology, who it is understood, is likely to visit this province in the next cold season.

6. As already explained in paragraph 3 much progress has been made during the year in carrying out the improvements to the Mandalay Palace and its surroundings. The date of the removal of the Church and Club from the Palace buildings has been temporarily postponed, but in other respects the restoration of the Palace has been completed or nearly so, and any necessary repairs to the Queen's monastery will be carried out during the current year.

7. The proposed programme for the year 1903-04 is, in His Honour's opinion, generally suitable subject to the remark that the Government Archæologist should place conservation in the forefront of his duties, and should not allow other work to interfere with this, the first and most important of his duties.

8. Mr. Taw Sein Ko has been working under difficulties in the past, owing to the want of a proper staff of expert assistants, but some relief has now been afforded to him by the appointment of an Archæological Surveyor, and if the instructions upon which stress is laid in this Resolution are carefully carried out, the Lieutenant-Governor anticipates that satisfactory progress will be made in future.

By order of the Lieutenant-Governor of Burma,

H. THOMPSON,

Offg. Rev. Secy. to the Govt. of Burma.

FORM A.

List of Buildings of Archæological, Historical or Architectural interest to be maintained by the Public Works Department.

Serial No.	District.	Township.	Town or village.	Nature of work.	Name.	Remarks by Government Archæologist.
1	2	3	4	5	6	7
	Mandalay	Mandalay	Mandalay	Civil and ceremonial architecture of the Burmese Kings.	Palace and *pyatthats* on the walls of Fort Dufferin.	The Mandalay Palace was removed from Amarapura in 1859, and was originally built by Shwebomin in 1845. Its architecture is unique and is derived mainly from Nipal and Magadha through Assam and Manipur.
	Do. ...	Do. ...	Do. ...	Tomb ...	King Mindôn's	King Mindôn died in 1878 He was the 10th of the Alompra dynasty, founded in 1753. Before he died he left instructions that his body should be buried and not cremated, thus violating the time-honoured customs of burning the dead bodies of the members of the Royal family. The mausoleum erected over his remains within the Palace stockade is a fine piece of work in glass mosaic.
	Do. ...	Amarapura	Amarapura	Do. ...	King Bodawpaya's.	King Bodawpaya reigned from 1781 to 1819, *i.e.*, for 38 years. His body was burnt on the site of the so-called "tomb" and the ashes were placed in a velvet bag and thrown into the river Irrawaddy.
	Do. ...	Do. ...	Do. ...	Do. ...	King Bagyidaw's.	Bagyidaw was a grandson of Bodawpaya. He reigned from 1819 to 1837. His body was cremated on the site of his "tomb" and the ashes were thrown into the river Irrawaddy.
	Do. ...	Do. ...	Do. ...	Do. ...	King Shwebomin's.	Shwebomin was the father of Kings Pagan and Mindôn, and reigned from 1837 to 1846. His body was cremated on the site of his "tomb" and the ashes were thrown into the river Irrawaddy.
	Do. ...	Mandalay	Mandalay	Do. ...	Queen Sinbyumayin's.	Sinbyumayin was the second Queen of Mindôn and mother-in-law of Thebaw. She died at Rangoon in 1900, and her body was permitted to be buried near Mindôn's tomb.
	Do. ...	Do. ...	Do. ...	Do. ...	Mèdawgyi's ...	Mèdawgyi was the mother-in-law of Mindôn. She died in 1874.
	Do. ...	Do. ...	Do. ...	Do. ...	Nanmadawgyi's	Nanmadawgyi was the chief Queen of Mindôn. She died in 1876 and was buried in the Palace stockade. Her tomb was the third erected within the sacred precincts of the Palace.
	Do. ...	Do. ...	Do. ...	Monastery ...	Myadaung Kyaung or Queen's monastery.	This monastery was built in 1885 by Supayalat, Queen of King Thebaw. It is a very fine specimen of Burmese architecture, and for that reason, its conservation was ordered by His Excelleucy the Viceroy in December 1901. The whole of the balcony floors are in a shaky condition, and the building leaks in several places. The *pyatthat* has a cant to one side, and is said to have been moved out of position by the storm of April 1901. The carved panels on the outside of the balcony are also in need of repair.

FORM A—coutinued.

List of Buildings of Archæological, Historical or Architectural interest to be maintained by the Public Works Department—continued.

Serial No.	District.	Township.	Town or village.	Nature of work.	Name.	Remarks by Government Archæologist.
1	2	3	4	5	6	7
	Shwebo ...	Shwebo ...	Shwebo ...	Tomb ...	King Alaung-paya's.	This King's name is also written Alompra. He founded the last dynasty of Burma, and reigned from 1753 to 1760. During his invasion of Siam he died at Martaban. His body was carried back to Shwebo and was buried within the city walls. Alaung-payn and Mindôn were the only two Kings of the dynasty whose bodies were not cremated.
	Myingyan	Pagan ...	Pagan ...	Pagoda ...	Annada ...	This pagoda was built by Kyanzittha in 1090 A.D. It contains stone sculpture of exquisite workmanship, representing scenes in Gotama Buddha's life, and terracotta tiles, representing scenes in the Jatakas or previous existences of Buddha. It enshrines the images of the four Buddhas of the present world cycle, and also an image of Kyanzittha, its founder. Its plan, which is in the form of a Greek cross, and its architecture, which recalls the days of Jainism, are unique.
	Do. ...	Do. ...	Do. ...	Do. ...	Manuha temple	This temple is situated at Myinpagan, which is about 2 miles to the south of Pagan. It was built by Manuha, the last of the Talaing Kings in 1059 A.D. It contains a recumbent image of gigantic proportions representing Buddha in the act of entering Nirvâna.
	Do. ...	Do. ...	Do. ...	Do. ...	Gawdawpalin ...	The Gawdawpalin pagoda was built by King Narapatisithu, who reigned from 1174 to 1198 A.D., in order to commemorate the ceremony of paying homage to the *manes* of his ancestors. Its history is recorded on a stone inscription.
	Do. ...	Do. ...	Do. ...	Do. ...	Thatbyinnyu ...	"Thatbyinnyu" signifies "Omniscience," and is one of the attributes of Buddha. The pagoda was built by King Alaungsithu in 1144 A.D., after the model of temples in Northern India. It has five storeys—the first and second were used as the residence of monks; images were kept on the third, the 4th was used as a library and on the fifth was constructed a pagoda containing holy relics The building is thus a combination of a stupa and vihâra, and its history is recorded on its walls.
	Do. ...	Do. ...	Do. ...	Do. ...	Shwegugyi ...	Built by King Alaungsithu in 1141 A.D., after the model of the "sleeping chamber" of Buddha. Its history is recorded on its walls and also, in Pâli, on a stone. The lithic inscription is celebrated for style and elegance of its composition.

FORM A—concluded.

List of Buildings of Archæological, Historical or Architectural interest to be maintained by the Public Works Department—concluded.

Serial No.	District.	Township.	Town or village.	Nature of work.	Name.	Remarks by Government Archæologist.
1	2	3	4	5	6	7
	Minbu ...	Minbu ...	Minbu ...	Pagodas and Nat shrines.	*Pagodas.* (*a*) Chanthagyi. (*b*) Sudaungbyi. (*c*) Shwetaza. *Nat shrines.* (*a*) Maung Yin Byo. (*b*) Ywadawin.	Since 1892 an annual expenditure of Rs. 100 has been incurred by the Public Works Department on the repairs of these buildings. The same amount, supplemented by local subscriptions, will continue to be spent through the agency of the local elders, who are under the control of the Deputy Commissioner, Minbu. Of these buildings, the Chanthagyi pagoda only has any historical record. It was built by Mohnyinmindaya, King of Ava, in 1426, in order to communicate his union with Shin Bomè the beautiful Queen of his predecessor, Kale-Kyedaungnyo, who had fled to Mansettawya for refuge. The Nat shrines appear to be dedicated to tutelary deities of the pre-Buddhistic type.
	Pegu ...	Pegu ...	Pegu ...	Pâli stone shed.	Kalyâni inscriptions.	The Kalyâni inscriptions are situated at Zaingganaing, the western suburb of the town of Pegu. When whole their average dimensions were about 7 feet high, 4 feet 2 inches wide and 1 foot 3 inches thick. There are 70 lines of text to each face, and three letters to an inch. The language of the first three stones is Pâli, and that of the remaining seven is Talaing, being a translation of the Pâli text. These inscriptions were erected by Dhammachetti or Râmâdhipati, King of Pegu, in 1476 A.D., in commemoration of the consecration by Talaing monks, who had returned from Ceylon, of a *thein* or hall for the proper ordination of Buddhist monks in Burma.
	Hanthawaddy.	Syriam ...	Syriam ...	Christian church.	Old Portuguese church.	The church was erected in 1749-50 by Monseigneur Nerini, the second Vicar Apostolic of Ava and Pegu and a member of the Barnabite Mission, which laboured in Pegu during the 18th century. The major part of the expenses of the erection was borne by Nicolas de Aguilar, a wealthy Armenian merchant. The form of the building is thus described by Monseigneur G. M. Percoto, Missionary to the Kingdom of Ava and Pegu and Bishop of Massulis: "In plan it consisted of a single nave, ornamented with arches and columns both inside and out. Its dimensions were as follows:—Length 81, breadth 31 and height 40 French feet. It was intended to have had a domed roof, but the arrival of the Coromandel workmen who were sent for to construct it was prevented by the war which arose, and the roof was therefore completed in another style. The whole building was a marvel to the Peguans, but what they more especially admired was a spiral staircase going up inside the tower."
	Sagaing ...	Sagaing ...	Sagaing ...	Inscription and shelter constructed over it.	Ywataung inscription-shed.	The shed was constructed in 1900 by the Executive Engineer, Shwebo, at the request of the Government Archæologist, and is situated near the European cemetery at Ywataung. The lettering of the inscription which dates from the 14th century A.D., has been somewhat obliterated.

REPORT

ON

ARCHÆOLOGICAL WORK IN BURMA

FOR THE YEAR 1902-03.

From TAW SEIN KO, Esq., Government Archæologist, Burma, to the Revenue Secretary to the Government of Burma,—No. 126—3A., dated the 14th May 1903.

I have the honour to submit an annual progress report of archæological work carried out during the year ending the 31st March 1903, together with a programme of work for the ensuing 12 months. The manner in which His Excellency the Viceroy's orders regarding the conservation of the Mandalay Palace were carried out is described in detail in the present report.

2. When the report is printed, I shall be much obliged to be furnished with a dozen copies.

Report of the Government Archæologist, Burma, for the year ending the 31st March 1903.

Carrying out of programme.

It will be convenient to note how far the programme laid down for 1902-03 was carried out. It consisted of six items:—

(i) The carrying out, in conjunction with the Public Works Department, of His Excellency the Viceroy's orders in respect of the preservation and restoration of the Palace and other buildings at Mandalay.

The Palace was removed from Amarapura by King Mindôn in 1859 A.D., and was re-erected at Mandalay. It was originally built by Shwe Bo Min in 1845 A.D. Its architecture is unique, and recalls its prototypes in Nipal, Magadha, and Cambodia.

Since the British annexation of Upper Burma in 1886, the sums spent on repairs and restoration in connection with the Palace have been—

	Rs.
Repairs to Palace buildings and *pyathats* on the walls of Fort Dufferin; completed in October 1889.	34,206
Gold-leafing the tombs of Mindôn Min, Mèdawgyi and Nanmadawgyi; completed in August 1900.	5,436
Repairs and restoration of Palace buildings; completed in February 1902	76,947
Special repairs to Palace buildings on the occasion of His Excellency the Viceroy's visit; completed in February 1902.	5,934
Alterations and additions to the Lily Throne room to make it suitable for a Durbar Hall; completed in February 1902.	1,764
Regilding the Lion Throne and Audience Hall; completed in March 1902.	47,707
Repairs to *pyathats* on the walls of Fort Dufferin; completed in March 1902.	11,764
Repairs to the different portions of the Palace; completed in March 1903	4,586
Total ...	1,88,344

The average annual charges for ordinary repairs and maintenance have been Rs. 5,000 on the Palace buildings and Rs. 5,000 on the upkeep of the grounds and pleasure gardens. In March last, the upkeep of the Palace gardens was made over to the Mandalay Cantonment Committee, an annual grant of Rs. 5,000 being made to the Cantonment Fund.

With the exception of the following three items, all the orders of His Excellency have been carried out:—

(*a*) The Protestant church located in the Audience Hall has not yet been removed, as the question of the troops remaining in Mandalay is

still under consideration, and as there is no other place inside the Fort available for holding service.

(*b*) The removal of the Upper Burma Club is held in abeyance for the same reasons as the church.

(*c*) Nothing has yet been done by the Public Works Department towards the restoration or repairs to the Queen's monastery. The work will be undertaken in the course of the current year.

The Executive Engineer, Mandalay Division, has furnished a report on the conservation of the Palace, together with its plan, and these are appended to the present report.

(ii) The establishment of a local museum in the Palace at Mandalay. The Local Government was prepared to set apart one of the rooms in the Palace building for the collection of plans and models of the Palace buildings and of relics connected with the Palace or Burmese Court. The collection should be confined to objects of local interest only, which it is considered advisable to retain in Mandalay rather than place in the Provincial museum, which it is proposed to establish in Rangoon. It was decided that the museum should be located in the Circuit-rooms on the Palace platform, and that a new circuit-house should be built elsewhere. These rooms were vacated only in February last. The construction of a model of the Palace, costing Rs. 1,500, for deposit in the museum, has been sanctioned; and a sum of Rs. 500 has been entered in the Archæological budget for the acquisition of other exhibits.

(iii) The establishment of a local museum at Pagan. In August 1902, orders were received from the Local Government sanctioning the construction, in the vicinity of the Ananda pagoda at Pagan, of a museum with shelves at an estimated cost of Rs. 2,300, and of an inscription shed with pedestals for inscriptions at a cost of Rs. 810. The work will be carried out by the Public Works Department. A list has been made of the inscriptions and other exhibits to be placed in the museum.

(iv) The revision of the lists of buildings for conservation, division by division, with the exception of Arakan.

The revision was not proceeded with because of the issue of Public Works Department Circular No. 17 of 1902 which requires personal inspection and research on the part of the Government Archæologist before recommendations are made for the conservation of selected Archæological buildings. A register is being compiled of buildings, whose conservation has been approved by the Local Government.

(v) An architectural survey of the Palace and other buildings at Mandalay.

(vi) A detailed archæological survey of Pagan.

Under the advice of the Director-General of Archæology, it was decided to carry out (v) first, and to defer (vi) to a more convenient season. Nothing, however, could be done, as it was after the close of the official year that the Government of India sanctioned, as a temporary measure, the appointment of an Architectural Surveyor, on pay not exceeding Rs. 150, and of a chaprassi on Rs. 12 a month. Final orders will be passed after the receipt of a report on architectural work in Burma from the Director-General of Archæology, who will visit the province towards the close of the current calendar year. The work to be done by the Architectural staff appears to be almost inexhaustible. After executing an architectural survey of the Palace and other buildings at Mandalay, and a detailed archæological survey of Pagan, other surveys should also be undertaken of ancient sites, like Prome or Srikshetra, which is mentioned by Hionen Thsang; like Pegu, Thatôn and Moulmein, which were centres of ancient Talaing civilization; like Tagaung, Ava, Amarapura and Sagaing, the ancient capitals of Burma Proper; and like Yazagyo and Inweyin in the Chindwin valley, which is redolent with the traditions of the Maurya dynasty under whose ægis Buddhism became a world-wide missionary religion.

Some difficulty is being experienced in securing the services of an Architectural Surveyor, who should be a competent draftsman as well as a good photographer. It is hoped that a qualified man will shortly be obtained from India with the assistance of the Director-General of Archæology.

WORK DONE DURING THE YEAR.

A.—*Office work.*

At the request of the Superintendent, Census Operations, Burma, the following notes were compiled:—

(*a*) on Burmese Buddhism;
(*b*) on Panthays;
(*c*) on Burmese sects;
(*d*) on Chinese dialects spoken in Burma;
(*e*) on the origin of the term "Burma."

Two articles on the "Origin of the Burmese race," and the "Introduction of Buddhism into Burma" were prepared for incorporation in the journal of Indian Archæology to be shortly published by the Director-General of Archæology.

A memorandum on the "Antiquities of Rangoon" was compiled at the request of the Deputy Commissioner, Rangoon Town Lands; and for the Deputy Commissioner, Mergui, was undertaken the decipherment, translation, and annotation of two Burmese Inscriptions of the 13th and 15th Centuries A.D. The former of these two inscriptions is particularly interesting as showing the extent of Burmese dominion before the break-up of the Burmese Empire in 1284 A.D., owing to the Chinese invasion under Kublai Khan. In those days, Tenasserim, now an insignificant village in the Mergui district, was a frontier outpost and a flourishing centre of trade with Cambodia and Malaysia.

The compilation of the above notes and articles involved much laborious research and expenditure of time.

Sixty-eight inscriptions found in the Mandalay, Myingyan and Pakôkku districts, were deciphered and printed; and materials were collected for the compilation of a treatise on the origin and development of the Burmese Alphabet.

The manuscripts and maps acquired for the Archæological Library were as follows:—

(1) History of Kalè;
(2) History of Tharrawaddy;
(3) Ancient History of Pagan in the Pali language compiled by Shin Gawdawara;
(4) Life of Dhammaceti, King of Pegu, in the 15th century, A.D.;
(5) Map of Ancient Prome showing the pagodas, sites of Palaces, and other localities of historic interest.

B.—*Archæological finds.*

There was only one "find" to record. In January 1902, the Subdivisional Officer, Pagan, sent eight metallic discs for examination and report. About 15 viss, of these had been found in a field of Indaw village, Kyaukpadaung township. The Chemical Examiner analysed all the specimens of metal qualitatively, and made a quantitative examination of one of them. He found that all the samples were all lead containing small quantities of copper. The disc, which was examined quantitatively, contained 97·7 per cent. of lead and 2·3 of copper. It is possible that these discs were used either as coin, or for alchemical purposes, *i.e.*, for transmuting them into an amalgam, which would look like, and pass off, as silver. The "find" was not of much intrinsic or archæological value, and the Subdivisional Officer was advised not to acquire the collection on behalf of Government.

C.—*Numismatics.*

At the instance of Dr. T. F. Pedley and Mr. H. L. Tilly, Chief Collector of Customs, a collecton of coins in the possession of Mrs. Luxa, wife of an employé of the Telegraph Department, was examined. It consisted of modern and ancient coins of gold, silver, and bronze belonging to various countries as Japan, China, Siam, the Straits Settlements, Arakan, Spain, Portugal, England and Mexico.

The collection was made by her father, late Captain White of Akyab. The owner wanted a fancy price for the collection, and it was not acquired by Government.

D.—*Custody of pagodas at Pagan.*

Eighty-one pagodas were added to the list of buildings at Pagan under the custody of Government, bringing up the total to 208. Detailed instructions were issued by the Deputy Commissioner, Myingyan, and the Government Archæologist to the village headmen and pagoda durwans placing the latter under the supervision and control of the former, and emphasizing the responsibility of all village headmen in the Pagan township in the matter of watch and ward over all archæological buildings in their jurisdiction. The following notice framed by Mr. L. M. Parlett, I.C.S., Deputy Commissioner, Myingyan, in November 1901, was printed and circulated:—

"Whereas much damage has been done in the past to the shrines, pagodas, and edifices at Pagan by visitors, who collect curiosities, and by traders, whose object is gain, it is hereby notified that on no account, whatever, may any fresco, image, carding, plaster, tile, brick, plate, or anything forming part of or belonging to the shrines, pagodas, and edifices of Pagan be removed, damaged, or interfered with. Durwans have been appointed to the charge of these buildings, and they have orders not only to protect the properties in their position, but also to see that any person, who does damage, does not escape. The police, too, have been directed to arrest persons, who steal from the pagodas, and to prosecute them. Any person, who is detained by the police for carrying off curics will have no cause to complain, and will have but himself to thank.

Recently a party of foreigners came to Pagan, and removed certain frescoes, carvings, &c. Their baggage was detained and searched. The stolen things were recovered, and the party was expelled from the Province."

In addition to the trust of the Thabyinnyu and Gawdawpalin pagodas, trusts were formed, in the course of the year, of the Shwezigôn and Ananda pagodas. The Shwezigôn enjoys the rents derived from 80 acres of *kwin* or alluvial land and 250 of *ya* or upland cultivation, while the Ananda receives an annual rent of Rs. 230 from 75 acres of alluvial land. These lands form part of the religious endowments attached to these pagodas, and the proprietary rights of the pagodas have been recognized and confirmed by the British Government.

E.—*Repair, restoration and maintenance of pagodas and other archæological buildings.*

Syriam.

At the instance of the Commissioner, Pegu Division, a sum of Rs. 65-8-0, was spent on rebuilding the fence of the old Portuguese church at Syriam, and on clearing the walls, &c., of shrubs and trees.

In the Archæological Budget for 1902-03, the undermentioned entries were made under the orders of the Local Government:—

No.	Name of work.	Amount required for maintenance.
1	2	3
		Rs.
1	Repairs to pagodas and *nat* shrines, Minbu	100
2	Durwans to look after pagodas at Pagan	1,000
3	Mindôn Min's tomb at Mandalay, Bagyidaw's, Bodawpaya's, and Shwe Bo Min's tombs at Amarapura.	250
4	The Mandalay Palace buildings with the exception of the Church, Club, Commissariat Office, Post and Telegraph Offices, some quarters, and Telegraph store-room.	5,000
5	The Queen's *kyaung*, Mandalay	1,000
6	The *pyathats* over the walls of Fort Dufferin, Mandalay	2,000
7	Pâli stone-shed, Pegu	50
	Total ...	9,400

At the representation of the Government Archæologist, all these allotments, with the exception of the first, were subsequently re-transferred to the Public Works Department Budget.

Minbu.

Since 1892, the Public Works Department has repaired, at the cost of Rs. 100 a year, the following pagodas and *nat* shrines at Minbu :—

(*a*) Chanthagyi pagoda;
(*b*) Sudaungbyi pagoda;
(*c*) Shwetaza pagoda;
(*d*) Maung Yin Byo *nat* shrine;
(*e*) Ywadaw Yin *nat* shrine.

As stated above, the maintenance of this work was made over to the Archæological Department in 1902-03. When His Honour the Lieutenant-Governor visited Minbu in July 1902, the local elders prayed that Government might continue to repair these buildings. His Honour decided to continue the annual subvention of Rs. 100 and to leave to the elders to carry out the repairs themselves, provided that public subscriptions were also invited for the purpose. Further, it was laid down as a condition that this amount was not to be spent on gilding or *pwès*, but on the execution of such substantial repairs as would ensure the permanent existence of these buildings, and that proper accounts were kept by the elders. Subscriptions amounting to Rs. 300 and Rs. 50 were collected for the repair of the pagodas and *nat* shrines respectively, and the Government grant was paid, through the Deputy Commissioner, Minbu, to the elders named below :—

Maung Taik Kyi, Maung Sein, Maung Hla Gyaw, Maung Pan Bu, Maung Po Min, and Maung Pan U.

The elders have been able to furnish the history of only one of these buildings, namely, the Chanthagyi pagoda, or the "Shrine of Great Happiness." It was built in 1426, A.D., by Mohnyin Mindayà, King of Ava, in commemoration of his union with Shin Bomè, the favourite queen of his predecessor, who died at Mansettawya, where he had sought an asylum.

Tagaung.

In a tropical climate, rank vegetation is one of the chief causes of the decay and destruction of masonry buildings, and the attention of the Archæological Department has been directed to the clearance and removal of such vegetation found growing on pagodas at Tagaung, Pagan, and elsewhere. The Deputy Commissioner, Ruby Mines, has arranged to have jungle cleared at the undermentioned pagodas, at an annual cost of Rs. 240, the expenditure being debited to the Public Works Department :—

(*a*) The Shwezigôn pagoda at Tagaung (Rs. 120);
(*b*) The Mozudaw pagoda at Maingdaing (Rs. 60);
(*c*) The Paungdaw-u pagoda at Myadaung (Rs. 60).

The jungle is to be cleared three times a year, namely :—

(1) in March and April, before the rains begin;
(2) in July and August when the rainy season reaches its height;
(3) in November and December, when the rains have ceased to fall.

Pagan.

A considerable amount of attention was devoted to the repair of some of the notable pagodas of Pagan. The estimates sanctioned for repairs were—

	Rs.
Ananda pagoda	3,304
Gawdawplain pagoda	4,496
Thabyinnyu pagoda	6,935
Shwekugyi pagoda	2,305
Manuha temple	4,204
Total	21,244

Up to the end of the official year, the expenditure against the sanctioned estimates was as follows :—

	Rs.
Ananda pagoda	495
Gawdawpalin pagoda	2,000
Thabyinnyu pagoda	3,198
Shwekugyi pagoda	599
Manuha temple	703
Total	6,995

The expenditure of this amount in the Pagan township, where the dry weather crops had withered through want of rain, and where the people were already threatened with scarcity, was gladly welcomed. In some respects, the works served as relief works. Fresh relays of 100 men were employed each day; they received good wages and supplied themselves with sufficient food.

A copy of the report of the Executive Engineer, Meiktila Division, on repairs to the pagodas at Pagan is appended.

In the execution of these repairs, three points press for consideration; the periodical destruction of vegetation; the disposal of rain-water in such a way as to prevent it from soaking into the plaster and brick-work of the buildings; and the restoration of the buildings in a style, which would approximate as near as possible to their original condition. The Archæological Clerk at Pagan has a recipé for the destruction of vegetation, which has been tried with some measure of success. It consists of an application of a mixture, in equal parts, of orpiment and chunam, to the stumps of trees and plants to be destroyed. For the satisfactory disposal of rain-water, the use of glazed drainage-pipes has been suggested. The employment, as far as possible, of local Burmese masons and architects has likewise been recommended.

Of the five buildings repaired by Government at Pagan, the Ananda pagoda is the most interesting. It was built by Kyansittha in 1090 A.D., and contains stone sculpture of exquisite workmanship representing scenes in Gotama Buddha's life, and terracotta tiles representing scenes in the Jatakas or previous existences of Buddha. It enshrines the images of the four Buddhas of the present world-cycle, and also an image of Kyunsittha, its founder. Its plan, which is in the form of a Greek cross, and its architecture, which recalls the days of Jainism, are unique.

The Gawdawpalin pagoda was built by King Narapatisithu, who reigned from 1174 to 1198 A.D., in order to commemorate the ceremony of paying homage to the names of his ancestors. Its history is recorded in a stone inscription.

"Thabyinnyu" signifies "omniscience," and is one of the attributes of Buddha. The pagoda was built by King Alaungsithu, in 1144 A.D., after the model of Buddhist temples in Northern India. It has five storeys: the first and second were used as the residence of monks; images were kept on the third; the fourth was used as a library; and on the fifth was constructed a pagoda containing holy relics. The building is thus a combination of a stupa and vihâra, and its history is recorded on its walls.

The Shwekugyi pagoda was also built by King Alaungsithu in 1141 A.D., after the model of the "Sleeping chamber" of Buddha. Its history is recorded on its walls, and also, in Pâli, on a stone. The lithic inscription is celebrated for the style and elegance of its composition.

The Manuha temple is situated at Myinpagan, which is about 2 miles to the south of Pagan, and a melancholy interest attaches to it. It was built in 1059, A. D., by Manuha, the last of the Talaing Kings, who had been brought captive from Thatôn by King Anawrata, together with his family, treasures, and Buddhist scriptures. It contains a recumbent image of gigantic proportions representing Buddha in the act of entering Nirvâna, a fitting symbol for the extinction of the Talaing monarchy.

Tours of the Government Archæologist.

In March 1902, Mandalay was visited in order to report, in consultation with the Executive Engineer, the manner in which His Excellency the Viceroy's orders regarding the conservation of the Palace buildings should be carried out.

In October I was ordered to Maymyo to confer with the Secretary to Government, Public Works Department, and the Superintending Engineers, Mandalay and Chindwin Circles, on the procedure to be adopted in dealing with Archæological matters. The result of the conference was the issue by the Local Government of Public Works Department Circular No. 17 of 1902.

My presence was required at Pagan, in November, to consult with Mr. M. Coode, Superintending Engineer, Chindwin Circle, and Mr. C. E. Housden,

Executive Engineer, Meiktila Division, regarding the repair of the Ananda, Gawdawpalin, Thabyinnyu, and Shwekugyi pagodas, and the Manuha temple.

In the same month, the Hon'ble Mr. A. T. Arundel, Member of the Government of India, Public Works Department, arrived at Pagan in the course of his inspection tour, and I was asked to show him round. The pagodas under repair were visited; and he was particularly struck with the stone sculpture in the Ananada pagoda. The Branch Archæological Office was likewise visited; and, on seeing a Tamil inscription found at Myinpagan, he suggested the despatch of a rubbing of it, for decipherment, to the Government Epigraphist at Madras. Dr. Hultzsch has kindly furnished me with the following translation and explanatory note, which note, which are of great interest as showing the prevalence of the Vaishnava faith at Pagan in the 13th century A.D.

Translation.

"Hail! Prosperity! (I) have no regard for merit, none for a heap of wealth, none at all for the enjoyment of lust. Whatever is to happen, let it happen, O God! in accordance with previous actions! This (alone) is to be prayed for (and) highly valued by me. In every other birth also let (me) possess unswerving devotion to the pair of Thy lotas-feet!

Hail! Prosperity! Let (this act of) worship prosper! (In) the temple of Nânâdesi Vinnagar Alvâr at Pakkam *alias* Arivattanapuram, I, Irâyiran Siriyân *alias* Sri-kulase-khara Nambi of Magodayarpattanam, in Mali Mandalam, made a Mandapa, gave a door, and one fixed lamp to burn constantly in this Mandapa. (Let) this prosper!

This meritorious gift (was made by) a native of Malaimandalam."

Explanatory Note.

"The inscription consists of one verse in the Sanskirt language and Grantha alphabet, and a prose passage in the Tamil language and alphabet. The Tamil characters are those of the 13th century of the Christian era. The Sanskrit verse is taken from the Mukunda Mâlâ (verse 6) a short poem by the Vaishnava Saint Kulasekhara, who, as shown by Mr. Venkayya, must have lived before the 11th century.

The Tamil passage records gifts by a native of Magodayarpattanam in Malaimandalam, *i.e.*, Cranganore, in Malabar. His name Sri-kulase-khara Nambi, stamps him as a devotee of the Vaishnava Saint, Kulase-khara, from whose Mukundamâlâ the opening verse is derived. The recipient of the gift was the Vishnu temple of Nânâdesi-Vinnagar at Pukkam *alias* Arivattanapuram, *i.e.*, Pagan, which, in the Kalyâni inscriptions, is styled 'Arimaddanapura *alias* Pugâma.' 'Nânâdesi-Vinnagar' means the 'Vishnu Temple of those coming from various countries.' This name shows that the temple, which was situated in the heart of the Buddhist country of Burma, had been founded and was resorted to by Vaishnavas from various parts of the Indian Peninsula."

In February to March 1903, Bhamo and Mandalay were visited to report on archæological remains. The sites of the old English and Dutch factories at Bhamo were completely covered with jungle, and the Deputy Commissioner suggested that another visit might be paid in April, May, or June. By that time, it was expected that the Subdivisional Officer would have cleared the jungle and framed an estimate for railing in both sites. On the return journey, the ruins of Amarapura were visited in company with Mr. Alleyne Ireland, Commissioner of Chicago University.

Programme of work for 1903-04.

Now that the appointment of an Architectural Surveyor has been sanctioned, there is every prospect that archæological work will be accelerated in future. I am, however, still somewhat handicapped as I have not been provided with an English copyist. I have had to make private arrangements for copying my voluminous correspondence with the Local Government, and with Civil and Public Works Department Officers all over the Province. If the Phayre Museum is transferred to the Archæological Department in the course of the current year, there will be a marked increase in the amount of clerical work.

I beg to propose the following programme of work for the ensuing year ending the 31st March 1904:—

(i) The Architectural Survey of the Palace buildings, Mandalay.
(ii) The repair and restoration of the Queen's monastery, Mandalay.
(iii) The equipment of the Museum, Mandalay.
(iv) The equipment of the Museum, Pagan.
(v) The preparation of an illustrated article on the Mandalay Palace for incorporation in the Journal of Indian Archæology.
(vi) The compilation of a register of archæological buildings, whose conservation has been approved by the Local Government.
(vii) Inspection of, and report on, buildings requiring conservation by Government.
(viii) The assumption of control of the Phayre Museum in the event of the removal of the "Zoo" from its present location to the Victoria Memorial Park. It is desirable that the collection of exhibits for the Provincial Museum should be proceeded with at once under the supervision of the Museum Committee, which was appointed by the Local Government in 1893, and reconstituted in 1899, with the Government Archæologist as Secretary to that Committee.

ANNEXURE A.

Report by the Executive Engineer, Mandalay Division, on the conservation of the Palace at Mandalay, dated 22nd April 1903.

[Reference—Viceroy's Minute on the Palace Buildings,—dated the 2nd December 1901.]

1. Plan showing existing state of Palace attached.

2. The following unscheduled buildings have been sold by public auction and dismantled, as per plan attached :—

(1) Post office.
(2) Telegraph office.
(3) Forest office.
(4 to 7) Four private quarters.
(8) Carver's workshop (rebuilt at the carver's cost below the Palace platform).
(9) Late Irrigation Superintending Engineer's office.
(10) Conservator of Forests' office, Western division.
(11) Major-General's quarters.
(12 and 13) Elephant sheds.
(14) Hlutdaw.

3. The Church (No. 15) has not been removed as the question of the troops remaining in Mandalay is still under consideration and as there is no other place inside the Fort available for holding service.

4. The removal of the Club (No. 16) is held in abeyance for the same reasons as the Church.

5. The whitewash that was smeared over several of the scheduled rooms in the Palace during its occupation as a residence or as offices by the British has been removed except from the Dowagar Queen's apartments, which has up to the 16th of March, been used as a Commissariat office. This will be done this year.

6. The three interior rooms have been re-whitewashed.

7. Crimson throne has been replaced behind the throne door, where it stood in King Thibaw's time.

8. The lions that stood on either side of King Thibaw's lion throne have been recovered, re-gilt and replaced. One lion had to be made new as only one could be found in the Palace garden.

9. The panels with glass incrustations have been replaced in their original position with the exception of the Club dining-room panels.

10. All traces of the recent occupation of the rooms in the Palace either as an official residence or as Government offices have been removed, except from the three buildings: Club, Protestant Church, and the Commissariat office.

11. Water tanks have been removed to a safe distance.

12. The vacated scheduled apartments and the gardens are open to the public from end to end, and the Palace is guarded by six durwans with a head durwan over them.

13. All vacated buildings have been dusted and cleaned.

14. The throne in the Hlutdaw or Council chamber has been sent to Calcutta. The building has been dismantled and removed.

15. All grey from outside wall and platform has been removed and the portions thus covered have now been whitewashed.

Note by the Viceroy on Public Buildings (other than the Palace), Mandalay.

1. Most of the *pyathats* over the gateways of the old city wall have been put in thorough repair during the year, only three remain to be done.

Five out of seven new *pyathats* to replace the ones which had disappeared have been built.

2. All dark colour wash on the gateways, curtains masking them, and the bridges across the moat has been removed, and the whole whitewashed.

3. Nothing has been done by this department towards the restoration or repairs to the Queen's monastery up to date.

Note on the Preservation of the Mandalay Palace by Mr. J. BENTON, Officiating Chief Engineer, dated the 6th December 1901.

5. Whitewashing has been removed from all the buildings [paragraph (4) (*c*) supra], except the two internal badly-lighted rooms. Commissariat office has only shifted out very lately so the Dowager Queen's apartments which were occupied by that office remains still to be done. The buildings from which whitewash has been removed have been painted red.

6. *See* note No. 2 of Viceroy's Minute.

7. The only buildings on the platform now used are—

(i) The Upper Burma Club and Church.

(ii) Buildings repaired whenever necessary.
(iii) Gilding washed during the year.
(iv) All traces of occupation of officers or residences removed from the vacated buildings.
(v) Perforated zinc doors behind throne entrances have been repaired.
(vi) The only residents on the platform now are those in the Upper Burma Club.
(vii) The doors of all the rooms which are gilded are shut from 6 P.M. to 6 A.M. To ensure safety, gates have been put at all stair-cases to the Palace platform and they are locked up from 6 P.M. to 6 A.M.
(viii) The necessary conservancy and caretaking establishment is maintained.
(ix) The glass panels in the buildings G and I, have been removed to their original position in the glass Palace. The Upper Burma Club has not vacated.
(x) The wooden figure of a lion in the garden summer-house has been restored to its original position by the lion throne. The other thrones have been properly placed as regards their position and the position of the umbrella stands beside them.
(xi) The masonry pillars outside the peacock throne have been re-erected perpendicularly.

8. (1) Post office removed to the new building constructed below the Palace platform.
(2) Telegraph office shifted to the building known as *sayat* north of the Commissariat godown in Fort Dufferin.
(3) Quarters occupied by P. W. D. subordinates vacated.
(4) Office of Deputy Conservator of Forests removed to Maymyo.
(5) Still used as a Roman Catholic church. No church built as yet.
(6) Northern Shan States Subdivisional office removed to Maymyo.
(7) Circuit-rooms vacated, new circuit-house has been built.
(8) Carver's shed dismantled and rebuilt below the platform.

9. Buildings mentioned in this paragraph kept in repairs throughout the year.

10. Gardens surrounding the Palace are being maintained; up to February last, they were maintained by the P. W. D., since then they have been handed over to the Cantonment Committee, Mandalay, by orders of the Local Government.

11. *See* paragraph 1 of Viceroy's note on public buildings (other than the Palace) in Mandalay.

Estimates were sanctioned as follows:—

	Rs.
Construction of new *pyathats*	43,968
Repairs to *pyathats*	23,000
Restoration of Palace buildings	5,280

Expenditure during the year 1902-03 as under—

New *pyathats*, five in hand	7,985
Repairs to *pyathats*, 37 in number	17,777
Restoration of Palace buildings	3,208

ANNEXURE B.

Report on repairs to Pagodas at Pagan.

In September 1902-03 it was decided by the Local Government that some of the pagodas and temples at old Pagan should be repaired and maintained by Government. The pagodas it was finally decided to repair and maintain are—

(1) Ananda,
(2) Gawdapalin,
(3) Thabyinnyu,
(4) Shwekugyi,

and the temples—

(1) Manuha,
(2) Nanpaya.

Estimates for repairing the four pagodas and the Manuha temple were prepared and sanctioned during the official year.

The estimated amount of repairs is as under,—

	Rs.
Ananda pagoda	3,304
Gawdawpalin pagoda	4,496
Thabyinnyu pagoda	6,935
Shwekugyi pagoda	2,305
Manuha temple	4,204

and estimate for repairs required to the Nanpaya temple will be made out next official year. These estimates do not provide for putting the pagodas and temples in complete order, this would indeed be impossible except at considerable expense, provision is made in them for removal of bushes, grass, &c., with which the pagodas are overgrown for repair to terrace over roofs with a view to stop leakage and consequent damage to arched roofs, replacing brick-work in arches, where arches are seriously damaged, and repairs to plaster, where this is extensively damaged. The repairs now being carried out are designed to, as far as possible, prevent further decay. The expenditure during the official year against sanctioned estimates above mentioned has been—

	Rs.
(1) Ananda pagoda	495
(2) Gawdawpalin pagoda	2,000
(3) Thabyinnyu pagoda	3,198
(4) Shwekugyi pagoda	599
(5) Manuha temple	703

Endorsement by C. E. HOUSDEN, Esq., Executive Engineer, Meiktila Division,—No. 2225, dated the 18th April 1903.

Copy of the above forwarded to the Government Archæologist, Burma, with reference to his No. 64—6P., dated 24th March 1903.

G. B. C. P. O.—No. 180, Rev. Secy., 2-9-1903—544.

Report of the Conference as regards Museums in India held in Calcutta, December 27th-31st, 1907.

The Conference was summoned by the Government of India, Department of Commerce and Industry, in order to give representatives of different local governments and native states an opportunity of discussing their future policy as regards local museums with one another and with the Trustees of the central (Indian) museum in Calcutta. Each Government or State was invited to send one or more delegates to the Conference, and it was laid down that the delegates should not necessarily be officers directly connected with the management of a museum. The Trustees were also invited to nominate delegates and to make arrangements in Calcutta for holding the Conference.

The following delegates were nominated:—

By the Government of Madras,

MR. E. THURSTON, L.R.C.P., F.R.M.S., &c., Superintendent of the Government Museum, Madras.

By the Government of Bombay,

THE HON'BLE MR. IBRAHIM RAHIMTOOLA, C.I.E., and MR. C. L. BURNS, Principal of the School of Art, Bombay.

By the Government of the United Provinces,

MR. R. BURN, I.C.S., Deputy Commissioner, Gonda, and MR. G. D. GANGULI, Curator of the Provincial Museum, Lucknow.

By the Government of the Punjab,

MR. PERCY BROWN, A.R.C.A., Principal of the School of Art, Lahore, and SARDAR SAHIB BHAI RAM SINGH, Vice-Principal of the same institution.

By the Trustees of the Indian Museum,

The Chairman of the Trustees (MR. T. H. HOLLAND, F.R.S., Director of the Geological Survey of India), the Superintendent of the Natural History Section (DR. N. ANNANDALE, D.Sc.), and the Superintendent of the Industrial Section (Mr. I. H. BURKILL, M.A.). These officers were also invited to represent the interests of the Government of Bengal.

By the Hon. the Agent to the Governor General in Central India,

MR. PERCY HIDE, M.A., Principal, Daly College, Indore.

By the Hon. the Agent to the Governor General in Baluchistan,

MR. J. W. N. CUMMING, Honorary Secretary and Curator, Quetta Museum.

By the Mysore Darbar,

MR. J. CAMERON, Superintendent, Government Museum, Bangalore.

By the Kashmir Darbar,

DR. A. MITRA, L.R.C.P., L.R.C.S., Curator, Srinagar Museum.

By the Baroda Darbar,

DR. M. K. KANGA, M.A., Director of the State Museum, Baroda.

By the Bhopal Darbar,

SYED ENAYET KARIM.

By the Meywar Darbar,

PANDIT GOURI SHANKAR, Superintendent, Public Library and Museum, Udaipur.

PROGRAMME OF THE MEETINGS.

The conference assembled at the Indian Museum on Friday, December 27th, 1907, at 10 A.M.

All the delegates were present, with the exception of those from the Punjab (who telegraphed that they had been unavoidably detained on their journey) and of Mr. R. Burn from the United Provinces, who wrote that local duties connected with famine would prevent his attending the conference.

The Chair was taken by the Hon'ble Mr. J. F. Finlay, C.S.I., Member of the Viceroy's Executive Council, who had kindly consented to convene the meeting. After welcoming the delegates to Calcutta and explaining briefly the genesis of the conference he called upon the meeting to elect a chairman. Mr. E. Thurston (Madras) proposed the name of Mr. T. H. Holland, who had taken a very active part in the preparations for the conference. The proposal was seconded by Mr. J. Cameron (Mysore) and carried unanimously.

Mr. Holland then delivered an inaugural address from the chair, which was vacated by Mr. Finlay.

Dr. Annandale was elected Honorary Secretary to the Conference on the proposal of the Chairman, which was seconded by Mr. Cameron (Mysore) and carried unanimously.

The topics to be discussed by the Conference were then considered and the following list was drawn up :—

1. Systematic exchange of duplicates and casts of unique specimens.
2. Provincial organization of collecting in the field.
3. The publication of results.
4. Disposal of type specimens, their registration in catalogues distributed for information of workers. The registration of new specimens.
5. Classification of public exhibits and reference collections.
6. Methods for the preservation of specimens and labels specially suitable to the climate.
7. Recognized special functions of particular Provincial Museums.
8. The preparation of guides for the public.
9. Art sale rooms in connection with Museums.
10. Certain questions as to details of Museum management put forward by the delegate from Baluchistan.
11. Financial aspects of Museums.
12. The question of separating the Botanical collections from the Lucknow Provincial Museum for the purpose of handing over the specimens to the Horticultural Gardens, Lucknow.
13. Question of an Annual Museum Conference.

It was agreed on the proposal of the Chairman, that each topic should be introduced by one of the delegates, but that the discussion should be informal. As no stenographer was present, each delegate who spoke on any topic was requested to send his remarks in writing to the Honorary Secretary to be incorporated in the report of the conference. It was agreed that a sub-committee should be appointed to summarize the discussion at the end of each meeting and draft resolutions based thereon.

The first topic was then introduced and discussed by the delegates present and the meeting was adjourned to allow the delegates from the Punjab to take part in the discussion.

On Sunday, December 29th, the delegates inspected the different sections of the Indian Museum informally.

The conference re-assembled at 10-30 A.M. on Monday, December 30th, Mr. Percy Brown and Sardar Sahib Bhai Ram Singh being present in addition to those who had attended the preliminary meeting. The Honorary Secretary announced that the former gentlemen had expressed their opinion in writing as to the questions discussed at the previous meeting. The following topics were then introduced and discussed :—

1. Provincial organization of collecting in the field.
2. The publication of results.

3. Disposal of type specimens, their registration in catalogues distributed for information of workers. The registration of new specimens.
4. Classification of public exhibits and reference collections.
5. Methods for the preservation of specimens and labels specially suitable to the climate.
6. Recognized special functions of particular Provincial Museums.
7. The preparation of guides for the public.
8. Art sale rooms in connection with Museums.
9. Financial aspects of Museums.

It was agreed that Mr. Cumming (Baluchistan) should discuss the various questions put forward by him with the heads of the Natural History and Industrial Sections of the Indian Museum.

The meeting was then adjourned until the following morning.

On Thursday, December 31st, at 10-30 A.M., it met to discuss the last two items of the agenda, and in the afternoon of the same day a final meeting was held in order that the resolutions agreed upon by the conference might be formally passed, after their wording had been carefully considered.

The proceedings terminated with a vote of thanks to the Chairman and the Honorary Secretary, both of whom replied in suitable terms.

INAUGURAL ADDRESS BY THE CHAIRMAN.

GENTLEMEN,

In thanking you for the compliment offered by electing me to be the Chairman of this Conference, I wish to convey to the delegates, on behalf of our Board of Trustees, a welcome to the Indian Museum.

As a supplement to the remarks made by the Hon'ble Mr. Finlay, who has explained the objects of our Conference, I might give a brief indication of the origin of the proposal to hold a conference in Calcutta. About three years ago, when we found that the Indian Museum was attaining dimensions too unwieldy for the present system of control, we had to face two alternative reforms—either the linking up of all sections under the administrative control of a single Director, who would also be the Inspector-General of Museums in India, or the division of the Museum into natural sections with independence as far as their purely internal affairs are concerned.

The questions involved have been very thoroughly discussed during the past three years by the Trustees of the Indian Museum, the Government of India and the Local Governments, the result being that the Government of India have now finally accepted, as the best solution of our difficulties, the breaking up of the institution into five distinct sections. The section dealing with Geology will remain as before under the Director of the Geological Survey. The other collections now under the control of a Board of Trustees will be divided into four sections—(*a*) Archæology, which will be handed over to the control of the Director-General of Archæology; (*b*) objects of industrial and fine art will be put under the control of the Principal of the School of Art, whose institution adjoins the Museum; (*c*) industrial collections will be placed under the Reporter on Economic Products; and (*d*) collections relating to Zoology and Anthropology will be administrated by a Superintendent directly responsible to the Board of Trustees.

In addition to the administration of the Zoological and Anthropological Museum by powers similar to those now possessed, the Trustees of the Indian Museum will act as an advisory body to Government with regard to the other sections. They will also control regulations relating to the compound, rules regarding the admission of the public, and the discipline of the servants; but the purely scientific work of the sections will be under the control of the departments to which they in future will be linked.

The organization thus projected for the Indian Museum differs in one essential principle from that of the Provincial Museums in India and most Museums in Europe. In the case of Provincial Museums, the collections are

generally too small to permit of the entertainment of specialists for each division of natural knowledge. The system of administration now accepted for the Indian Museum would, therefore, not be practicable from the financial point of view for such institutions. The Madras Museum is an instance of an institution that approaches the stage requiring specialization, but as a Provincial type it has attained, under the management of Mr. Thurston, what should be regarded as an ideal Museum of the kind. In most European Museums, the conditions attached to legacies and bequests, as well as the complicated vested interests involved, make it difficult, and in some cases impossible, now to introduce a system of administration which some of us regard as a more scientific classification of functions than the system of placing a compound Museum, including exhibits of all classes, under one Director. The collections in the Indian Museum have now attained dimensions that necessitate and justify the employment of separate scientific specialists for the various natural sections. Fortunately, on reaching this stage, we are still but slightly tied by vested interests, and the Government have now decided to adopt the principle of decentralisation before the machine has reached a state of complication too great to permit of the application of the new system of classification. It has been decided, with sanction of the Secretary of State, to introduce during the next session an Act in Council which will permit of the required devolution of responsibilities and the corresponding reform in the constitution of the Board of Trustees.

With the formulation of a satisfactory scheme of reorganization for the Indian Museum, arose the question of our relationship to the Provincial Museums. The alternative scheme provided for the appointment of an Inspector-General, whose duties would be to bring the Central Museum into correspondence with those in the provinces for the purposes of exchanging specimens, and generally to bring all the institutions to a more uniform and higher level of efficiency. To meet the loss of this feature of the scheme that provided for a single Director of the Indian Museum and Inspector-General of Museums in India, Mr. Cousens of Poona suggested that some of the functions of the proposed Inspector-General might be accomplished by periodical conferences of Curators. As the responsibilities and qualifications of the Curators differ almost as widely from one another as their Museums do, it appeared to be dangerous to draw up a definite system for organising periodical conferences without first making an experimental test of the scheme proposed. Consequently the Government of India invited the Local Governments and States to send representatives to a Conference to be held in Calcutta during the present cold weather and the delegates now assembled have come in reply to this invitation.

The questions which I have suggested for discussion deal mainly with problems that specially concern museum curators in India. When we have shown that we can discuss these with profit, we shall be in a position to make recommendations regarding the future organization of conferences if they appear to be practicable and likely to lead to profit. The first item of business to undertake is the appointment of a Secretary for the present Conference, and as Dr. Annandale has acted in this capacity so far for the Local Committee, and has the machinery at hand for the clerical work necessary, I would suggest his name as Secretary of the Conference.

SUMMARY OF DEBATES WITH RESOLUTIONS PASSED.

First subject—moved by Dr. Annandale,

"*Systematic exchange of duplicates and casts of unique specimens.*"

I. *Dr. Annandale*, Superintendent of the Natural History Section of the Indian Museum, opened the debate. He stated that the Indian Museum possessed large stores of duplicate zoological specimens, which he would be very pleased to distribute. This was rendered impossible at present by the smallness of the Museum staff, both as regards trained zoologists and as regards trustworthy subordinates skilled in the sorting and packing of

specimens. Such subordinates were difficult to obtain in India and had to be trained in the Museum. It was most important that no specimen should be sent out from a scientific institution with a name that was not absolutely authentic. In the case of a few groups of animals the Museum would be glad to receive and classify collections in exchange for a proportion of the specimens, but the high degree of specialization to which the science of zoology had attained made it impossible at present to undertake work of the kind except to a very limited extent. The Indian Museum was always glad to receive duplicate specimens from Provincial Museums, because, except in a very few groups of animals, the fauna of India was still practically unknown. Nothing was too common to be of value; specimens which were not wanted for the Museum itself could generally be exchanged for others that were wanted from European or American Museums. The Indian Museum was the central Museum for the whole of India and as such was bound both to help Provincial Museums and to ask help from them. Its main function, so far as the Natural History Section was concerned, was to collect and preserve for reference as complete a collection of the Indian Fauna as was possible and to do such research upon the accumulated material as would elucidate the varied problems connected with the zoology of the Indian Empire and the surrounding countries.

II. *Mr. Holland* mentioned that, as regards geological specimens, he had undertaken for the Nagpur Museum to name the mineral and geological exhibits, and to add from time to time specimens collected by the Geological Survey officers who were working in the Central Provinces. But the offer was made and accepted on the understanding that unique specimens, types and material of exceptional scientific value found in the Nagpur collections should be transferred to Calcutta. As no other Museum in the country contains a sufficient number of such specimens to make their retention the foundation of a reference collection for any branch of geology, the same system might be adopted for all the Museums in India, without fear of diminishing their average worth; on the other hand the Provincial Museums would all gain largely by the adoption of this proposal. Obviously such a system could not be applied indiscriminately to all subjects; for instance, Archæology and Numismatics are represented by first class reference collections in some Provincial Museums.

His principal difficulty in effecting exchanges and in making donations to other Museums was, as explained by Dr. Annandale, insufficiency of staff to do the purely mechanical work of sorting out, packing and cataloguing the duplicate material that could readily be spared for other museums. It was also difficult to learn what was most required by the Provincial Museums; but this difficulty might be removed and the other partially obviated by the Provincial Curators themselves taking the opportunity, when in Calcutta, to select from among our collection of duplicates, the specimens they require. It would be perfectly easy to grant facilities for such a practice as far as Geology was concerned.

One of the chief defects of the geological collections was poverty in the commonest types of rocks and minerals, such as ordinary quartzites, sandstones and shales. These naturally, presenting no features generally of scientific interest, were not collected ordinarily by officers in the field; but they were wanted in considerable numbers for the use of students in the various Colleges and Museums of India. The Geological Survey proposed, therefore, as soon as practicable, to appoint two or three collectors, whose duties would be to sample occurrences of unusual value, to collect hand-specimens of the commoner rock-types, and, so far as possible, to make up collections to be given as donations to the smaller Museums and Colleges.

III. Commenting on these subjects *Mr. Cameron* (Mysore) enquired what arrangements could be made to meet charges for packing and forwarding such specimens, and suggested that while the Indian Museum would probably meet its own charges the Provincial Museums should do the same. He also warmly supported the Chairman's suggestion that representatives from Provincial Museums might be allowed to visit the Indian Museum for the purpose of making approved sections from time to time and that on such

occasions they should not come empty-handed, but bring duplicates that may be required at Calcutta from their own Museum.

IV. *Mr. Burkill* said that he could supply duplicate material as worked up and would prefer to do it on indent. He did not demand a definite *quid pro quo*, believing that a good understanding was far better than any contract.

V. *Mr. Thurston* (Madras) suggested that the zoological section of the Indian Museum might be glad to receive duplicate specimens, even of common species, from the various Provincial Museums, for exhibition, distribution or reference in the reserve collection.

VI. *Mr. Ganguli* (United Provinces) remarked that the best way in which co-operation could be maintained in respect of exchanging duplicate specimens or of procuring new specimens for each museum would be by preparing lists of desiderata and circulating them to institutions which were in a position to supply them. These remarks had special reference to collections of natural history specimens. With the exception of the Indian Museum, Calcutta, few organizations at present existed which were able to meet the requirements of Provincial Museums after supplying their own. With reference to the question raised by Dr. Annandale as to the expense and labour involved in getting up duplicate specimens for Provincial Museums, he remarked that the cost of such specimens should be made a charge on the institution benefited by them, the Government of the Province concerned providing funds to meet the same in cases where it could not be settled by exchange.

VII. *Mr. Burns* (Bombay) said that the question of making casts of museum specimens depended only upon the addition to the staff of museums of a competent moulder. The training of such men could either be undertaken at the four principal Schools of Art, or one of them could open a special section for this purpose. The men to be trained could either be natives of the locality in which the School of Art was situated, or selected men could be sent by Museums to undergo a course of training at the School. The latter proceeding would be, in his opinion, preferable.

VIII. *Mr. Hide* (Central India) suggested that the difficulty of recruiting the subordinate staff of the Indian Museum might be met by sending a circular each year to the Head Masters—and specially the English Head Masters—of large Indian Schools. The circulars would make clear the kind of men wanted and would give an account of the pay and prospects of men employed in the Museum.

IX. With reference to the remarks made by Dr. Annandale regarding the distribution of duplicates in the Indian Museum among other Museums in India, *Mr. Cumming* (Baluchistan) agreed with the Chairman that each Museum should send a representative to Calcutta to make such selection as may be actually required from among the duplicates in question, as many Provincial Museums might not desire or have room for specimens other than those of local interest. As regards Provincial Museums supplying the Indian Museum with specimens he agreed that this was very necessary so far as duplicates were concerned. In the case of single specimens these should be retained by the Provincial Museums concerned; but casts might be supplied or, when practicable, the originals might be sent to the Indian Museum for inspection, registration and return. Where the Indian Museum had only a few duplicates of specimens which might be of use to several museums they might be issued to Museums in the same order as was observed in connection with the distribution of coins.

X. *Dr. Mitra* (Kashmir) suggested that every local Museum should contribute, whenever it was possible to do so, duplicates of specimens which might be of interest and which might not be present in the Indian Museum. The Indian Museum represented the Museums of the Indian Empire and therefore should contain everything which could be found in all parts of the Empire, to which end the local and provincial museums should help. The best specimens of Arts and Industrial products of every part of the Empire should be shown in the Indian Museum. This would, for obvious reasons,

greatly benefit these industries. He should, for instance, like that there should be a "Kashmir Court" in the Indian Museum where representative selections of Kashmir Art Industries might be kept. If the Indian Museum could bear the cost, well and good, but as Kashmir Art Industries would be greatly benefited by such a show he would be greatly pleased to recommend the traders and the Darbar to consider the question of bearing some portion of the cost. Calcutta was visited by people from all parts of the world, so the advantages of such a permanent exhibition of local art industries were obvious. As regards exchanges of specimens, whenever duplicates were available it should be done. Casts of unique specimens or photographs might also be exchanged.

XI. *Mr. Brown* (Punjab) proposed that something might be done with regard to a systematic exchange of reserve specimens, by each Museum publishing at certain intervals (say quarterly) a list of objects of which it has duplicates, and circulating this among other museums. At the same time a few of the more important requirements of the Museum might be indicated in a separate column. He did not say that this would meet the case in its entirety, but it would be a commencement, and might be the means of bringing the Museums at least into touch with one another, leading to larger developments later on. He thought this might be of use where a Curator required a particular specimen to complete a series and was not certain of the locality from which it could be best obtained.

The above was only an alternative to the proposal that Curators should visit each Museum in turn to see what articles were in those Museums of which they require duplicates or casts. What was regarded as a common species in one Museum, might be rare in another, and one for which the Curator of the latter has been searching for years. Correspondence would not bring these cases to light and he thought that they could only be met by personal visits. Some action might be proposed to bring this to the notice of local governments, etc., to enable Curators to make a tour of all the Indian Museums.

XII. *Sardar Sahib Bhai Ram Singh* (Punjab) suggested that the curators of the Indian Museum and of Provincial Museums should arrange occasionally a list, with photographs of the objects of which they had duplicates, and should send it to the other Museums. This system would enable the Curators to pick out such duplicates as they required. It was most essential that the Curators should make occasional visits to the other Museums. A general meeting of the delegates should be held annually, generally in Calcutta, and sometimes in Bombay, Madras, etc., wherever the Conference might appoint from time to time.

In connection with this debate the following resolutions were passed unanimously:—

1. That the systematic exchange of duplicates and of reproduction of unique specimens between the Indian Museum and the Provincial Museums would be beneficial to both from a scientific and economic point of view.
2. That in order to ascertain the wants of the different Museums as regards the duplicates and reproductions, the Superintendent of the Indian Museum should have opportunities of consulting with the officers of the Provincial Museums* from time to time.
3. That lists of duplicate specimens available for distribution in the various Museums should be circulated.
4. That, in order that these proposals should be carried out, it is necessary that there should be a considerable increase in the expert staff of the Central Museum at Calcutta and in the skilled subordinate staff both of the Indian and of Provincial Museums.
5. As the qualities and training necessary for subordinates who have the sorting, cataloguing and distribution of specimens cannot be gauged by the ordinary standard of examination, Directors

* The word "Provincial" in this respect is understood to include Presidency and State Museums.

of Public Instruction in India should be informed of the qualifications necessary for the work and for the prospects of the boys fitted to undertake it, and that selected candidates for the posts in the Provincial Museums should undergo a period of training in the Indian Museum.

Second subject—moved by MR. J. W. N. CUMMING,

"*Provincial organization of collecting in the field.*"

I. In opening the debate *Mr. Cumming* stated what had been done in the direction of collections in Baluchistan.

The Quetta Museum and Library building had been formally opened to the public during the autumn of 1906. Prior to this, however, a fairly large and useful collection of works of reference, specimens of local arts, manufacture and economic products, agricultural implements, and objects of archæological interest had been collected by Mr. Hughes Buller (now of the Bengal Service) in connection with his duties as Superintendent of Imperial Gazetteers, Baluchistan. These were transferred *en bloc* to the Museum. The Museum once opened, gentlemen who were interested in natural history had promptly come forward and generously presented some of their valuable collections of works of reference, shells, birds' eggs, etc., so that the Museum had a good deal of material to start work on immediately. To further the work of collecting the Hon'ble Sir Henry McMahon, Agent to the Governor General, personally interested himself in the matter, convened a public meeting of the Residents of Quetta, there and then formed what is now known as the Baluchistan Natural History Society, of which he himself accepted the Presidentship and induced many of the members to also join the Bombay Natural History Society. The latter Society in return had presented the Baluchistan Society with a complete set of all the back numbers of their journal.

As the space in the museum building was somewhat limited it was made a condition of joining the Baluchistan Natural History Society that members should only contribute to the Museum objects obtained locally and should be most particular in recording on their contributions the locality whence obtained, with date. The formation of this Society had been extremely helpful to the Museum as free contributions of various sorts come in rapidly. In addition gardeners, cultivators and others of the poor class had been induced to bring all the rats, snakes, etc., they could secure and small sums were paid as remuneration for their trouble, so that the Museum obtained the collections by donations, from persons interested in Natural History and also by purchase. The donations, however, came mostly from persons living in and within easy reach of Quetta and gave no trouble. The difficulty arose in connection with the collections further afield in the Province, whence it is impossible to send in to Quetta certain classes of zoological specimens without their going bad, unless previously cured. To meet this difficulty partly Mr. Cumming had asked the British Museum for 30 copies of each of four small pamphlets issued by them containing instructions for the curing of skins of birds, mammals, etc. These on receipt would be distributed among gentlemen living in places distant from Quetta. The authorities of the museum also induced natives in search of employment and willing to do so to come and learn how to skin and cure birds and mammals and what to do with reptiles, etc. On applications being made for the services of such men by officers proceeding on tour or on a shooting excursion these men were recommended for employment and when necessary a small allowance was paid to them by the Museum in addition to what they may receive from their employers. This, however, was a somewhat slow process and it was proposed to recommend to the Museum Committee that Political Agents be asked to send to the Museum one or two men from the Head Quarter stations of their districts, if not from every Tahsil, who could be taught by the Museum taxidermist just what is essentially necessary, and in turn teach others. Officers living away from the railway line in the remote part of the province could then employ these men in any capacity they like and if necessary the Museum might add a small allowance to men who prove useful in curing

specimens sent to it, or to fix a charge for specimens sent by them independently. Shikaris would, Mr. Cumming thought, form a suitable class of men to try this experiment on. Models and specimens of arts and manufacture of considerable value would have to be purchased by the Museum; but this did not come within the scope of the present discussion. Another plan which might be tried would be to invite private collectors to exchange or to bring to the Museum their collections for inspection, casts or descriptions and any particulars of interest being taken in the case of rare specimens.

It was very necessary that all specimens donated to a Museum should be acknowledged as soon as possible. This should be done even in cases where identification meant delay, exact information in regard to which might be promised and supplied later on.

II. *Dr. Annandale* referred to the importance not only of organizing the local collection of specimens of all kinds but also of correlating the results obtained. As regards zoology his remarks on the exchange of duplicates applied to the present debate also. No zoological survey of India was officially recognized in the sense that a geological, a botanical and an ethnographical survey were recognized. Nevertheless, the Indian Museum was doing a good deal, considering its limited resources, towards collecting material for such a survey and would welcome the assistance of provincial agencies. In the recent past, he was afraid, that the Museum, notwithstanding the energy and scientific knowledge of its former officers, had been unable to do much for the study of the land fauna of India. Thirty years ago there was a band of amateur zoologists in the country who made large collections and presented them to the Museum, but nowadays no one had much time for anything but his official and professional work, while sportsmen were inclined, naturally enough, to send their trophies to the British instead of the Indian Museum, the latter having given them little assistance. The Indian Museum had had until the last few months, no collector, and the officers of the Natural History Section had been mainly occupied with the study of deep-sea animals dredged by the Survey Ship "Investigator." Government had recently sanctioned the employment of a collector, however, and it was to be hoped that an increase in the trained staff of the Museum would be granted which would allow of more frequent work in the field. Collections made by a scientific man, even incidentally to his more strictly scientific researches, were generally more satisfactory than those made by a man without scientific training. An exact record of locality, date, altitude and even of meteorological conditions was of great importance as regards zoological specimens and the two of these data first mentioned should never be omitted. It was important also to supply collectors with suitable labels, which would differ considerably with the class of specimens to be collected. Labels suitable for record in the field were not in all cases identical with those best adapted for permanent record; but this was a subject which will be dealt with better in another debate.

III. The delgates from Bombay and Madras expressed an opinion that more help might be given by the Indian Museum in the training of taxidermists, collectors and assistants for provincial museums. Reference was also made to the beauty and life-like character of specimens set up in some of the American museums.

Dr. Annandale pointed out that a modern taxidermist of the first class must be something of an artist, as well as having a knowledge of the anatomy and of the habits and natural attitudes of animals. The salary of the head taxidermist in the Indian Museum was Rs. 85—3—100 To teach taxidermy of the kind referred to would need an exponent of the art from England or America and the Indian Museum could not afford to employ such a man.

IV. *Mr. Burn* (Bombay) suggested that possibly Government might grant scholarships to Indians willing to learn the art in England or America; but it was pointed out by *Dr. Annandale* that there was no such thing in England at any rate, as a school of taxidermy. He believed that most of the work in the British Museum was done by a private firm, who would probably demand a heavy premium from an apprentice. *Mr. Burn* said

that he did not wish to press his suggestion in view of the information supplied by *Dr. Annandale*. In any case he was of the opinion that a first class taxidermist should be employed in the Indian Museum both to work on behalf of that Museum and to give instructions to men from the Provincial Museums.

V. *Mr. Brown* (Punjab) was of the opinion that in this connection the matter of loan collections might be brought forward. With regard to the art and industrial art objects it was believed that valuable collections of pictures and artware were found in the houses of native princes, Chiefs and wealthy gentlemen which they would readily loan for longer or shorter periods to the Government Museums. In the Punjab it was proposed to issue a circular to ruling Chiefs and others asking them to kindly consider this scheme and to communicate with the Curator of the Lahore Museum if they have any unique art object suitable for display in the Art Department.

Dr. Annandale was of opinion that it was dangerous in India for a Museum to accept collections on loan. Such collections would be accepted not on their merits but on those of the persons who offered them. It would be difficult to get rid of them later and they would become a white elephant. As regards collections presented to Museums it was becoming a recognized principle that they should not be kept separate as a whole.

In the discussion that ensued with regard to a proposed limit to the length of time articles should be loaned to Museums it was pointed out that in the case of the South Kensington Museum and British Museum collections remained for years in the buildings and no objection to this had ever been brought forward. In the case of several valuable loan collections of pictures and pottery in the South Kensington Museum, to all intents and purposes these were the property of the museum authorities, but were nominated "loan collections" in order that the owner might claim them and have them returned if at any time he so desired.

VI. *Sardar Sahib Bhai Ram Singh* (Punjab) was of the opinion that in this connection it would do much good to the Indian arts and industries if efforts were made to ask the owners of unique and valuable artistic collections to lend their objects to the Museum of their province for display in the loan galleries where they would be appreciated by a larger community than a limited number of friends and acquaintances of the owners. Such collections would no doubt be liable to be returned to the owners at any time at their request.

In connection with this debate the following resolutions were passed unanimously:—

1. That taxidermists for the provincial museums should be trained in the Indian Museum, and that an expert taxidermist should be employed from Europe or America and attached to the staff of the Indian Museum, in order that he might both do the work of that institution and supervise the training of the provincial men.
2. That in order to assist the Indian Museum in its survey of the fauna of India, local museums shall give what assistance they can, and that the Superintendent of the Natural History Section shall be asked to draw up and circulate a statement of the special requirements of the Museum.
3. That in order to interest recognized authorities on Natural History, Archæology and other subjects in the different provinces they shall be given a definite position on the staff of the Museums by their appointment as Honorary Officers.

Third subject—moved by DR. ANNANDALE,

"The publication of results."

I. *Dr. Annandale* in introducing this topic dwelt on the importance of concentration as regards the scientific publications on Indian subjects. Speaking generally, the greatest difficulty experienced by scientific workers

in India was the lack of scientific literature. This difficulty would be greatly reduced if it were possible to devote a single journal to each branch of science and to publish everything bearing on the subject in that journal. Of course it was impossible to prevent the publication of stray scientific papers in European and other journals and it would do far more harm than good to attempt to interfere with the scientific publications of private societies. It would, however, be a great step if it were possible to claim that all geological papers published officially in India were issued in the periodicals issued by the Geological Survey, all zoological ones in these published by the Indian Museum, and so on. Most of the scientific departments under the Government of India now issued their own publications, and others were following suit. There seemed also to be a tendency in these publications towards uniformity as regards arrangement and style, and this should also prove beneficial. It was impossible nowadays, however, for a scientific man to be a universal scientist and each branch of science was distinct from all others to a degree not generally realized. It was therefore better to keep the separate branches separate as regards publications, in order on the one hand to ensure that the periodical or periodicals dealing with them were under the immediate control in each case of those who were acquainted with the particular branch of science concerned, and on the other hand to prevent any one periodical becoming unwieldy.

II. *Mr. Holland* agreed for the support of journals devoted to groups of closely related subjects, and pointed out the difficulty of subdividing too freely in this country, where there is a limited number of original workers. Generally, the balance of advantage is in favour of extending the range of questions covered by a journal rather than splitting it into "series," which give so much trouble to the librarian and to the student, whose mechanical work of quoting previous literature is now becoming dangerously burdened by the intricate systems of publishing in "series" and "parts." If each volume of a journal be fully indexed, and if the papers be made sufficiently short to allow their titles to be expressive of their contents, there was very little disadvantage in having, for instance, Palæontological papers alongside papers on Mineralogy and Petrology in the same journal in India. Although the workers in India were sufficiently numerous to support separate journals for Geology, Zoology, Botany, and some other branches of science, we would possibly not be able to support local journals for each. The question as to whether it would be best to support a local journal covering all branches of Natural History, or a central journal devoted to a well recognized, distinct branch, must give rise to differences of opinion; but for the publication of the results of original value it was obviously best to support the central special journal rather than the local one covering many objects. However, one could not lay down laws that would destroy the individuality of established publications, or interfere with the natural development of new journals that were of value even if they were the outlet of a local and temporary wave of scientific enthusiasm.

With regard to the *form* and *size* of a publication, uniformity could be advocated with less danger of destroying individuality. The serious student, who had to use and quote scientific literature, should be considered before the varying tastes of the printer and publisher. In most subjects it is generally most practicable to have two "series"—one containing the short papers and notes of interest that may be developed during a long investigation, and the other including monographs and memoirs of a size large enough to swamp the average "part" of the smaller journal, and comprehensive enough to give a general survey of the subject treated. By the Geological Survey the term "Records" was applied to the former journal, while the larger papers were published in a separate series of "Memoirs." For the student who has to quote literature, it was important in all publications to show at the top of each pair of pages—

(*a*) the title or recognized abbreviation of the journal,

(*b*) the number of the volume and year of publication,

(*c*) the author's name and short title of the paper.

Mistakes in quoting the volume or year of the publication were liable to occur if the student has to rely on the title-page of the volume, as errors in binding were so common. In any case the verification of these details incurred a loss of time, especially when two volumes were bound together, as was the custom for small publications in some libraries in India.

It was desirable also that a very full index should be issued with each volume, and possibly an amalgamated index with each ten volumes. With a full index the drawbacks of issuing papers on various subjects in the same journal would be greatly diminished.

With regard to the *size* of the two classes of publications, it was generally found best to issue papers of the "Records" type as octavo journals and "Memoirs" as quarto publications. An attempt had been made some years ago to standardise the octavo scientific journals by keeping to the size adopted for the *Reports of the British Association*, the *Quarterly Journal of the Geological Society* and the *Proceedings of the Institution of Civil Engineers*. For many years the *Proceedings of the Royal Society* were issued in this size; but it had been found desirable in the last named instance to adopt the super royal octavo size, and this size had been maintained from the beginning for the *Records of the Geological Survey of India*. The quarto size was adopted for most series of memoirs because of the facilities they offered for the large unfolded plates that were necessary especially in Natural History, as it was obviously desirable when practicable to figure type-specimens natural size. The *Philosophical Transactions of the Royal Society* had been copied in size and style by many societies, and generally they offered the best all-round conveniences for publications of the memoir and monograph type. It is to be regretted that this size was not adopted for the *Memoirs of the Geological Survey of India*, instead of the super royal octavo for ordinary and the large quarto for Palæontological memoirs. It was proposed when Vol. XL of the *Memoirs* was reached to adopt the size and style of the *Philosophical Transactions* for both kinds of memoirs in one amalgamated series.

Recently the Trustees of the Indian Museum had adopted the term *Records of the Indian Museum* for their short papers on Natural History, and for the Forest Department Government have sanctioned the inauguration of a similar publication. In both these cases quarto *Memoirs* are published to supplement the *Records*.

It was an advantage to most serious readers to have a list of the papers previously published in the series attached to each "part" of the *Records* and *Memoirs*. The "part" is thus necessarily issued in paper covers and, as the list could be kept in type and brought up to date with each new "part" published the system involved very little cost or labour, while it might be of inestimable value to many readers. The list of papers published by the Geological Survey occupied 18 pages of the paper-covers issued with each part of the *Records* and *Memoirs*.

The list was now becoming dangerously bulky but it seemed unwise to abolish it in view of the great value it has been to students.

III. With regard to the Art Department of Museums it was pointed out by *Mr. Brown* (Punjab) that up to the present no steps had been taken to produce any publication devoted to this subject which in any way corresponded with the journals or records relating to Geology, Zoology, etc. Efforts should be made to bring publications on this subject into line with the other branches of Museum work. It was remarked that there was a certain amount of literature published from time to time on Art and Industry, notably the Technical Art Series, the Journal of Indian Art, and the Industrial Monographs, but it was felt that there were drawbacks to the utility of these books which it might be found desirable to remove.

These were, (*a*) the want of completeness in dealing with each subject; (*b*) a considerable degree of overlapping, due to the independent manner of their issue, and (*c*) the fact that no single art is dealt with in a comprehensive manner.

In the discussion that followed these remarks it was suggested that in place of these books a periodical should be produced which would deal with each art subject exhaustively in turn and so ultimately build up a series of records which would together form a complete survey of the Arts and Industries of India, and it was proposed that a sub-committee be formed to consider this subject and to formulate a scheme which would enable the above suggestion to be put into effect.

IV. *Sardar Sahib Bhai Ram Singh* was of the opinion that journals might be published half yearly on various topics of Art and supplied regularly to all the Museums. One of the Curators of the Museums might be elected as an editor to whom articles might be contributed by other curators for insertion in the journals. In his opinion the Indian Museum would quite suit the purpose.

The question of the Art publications was submitted to a sub-committee consisting of the following delegates :—

I. H. Burkill, Esqr.
E. Thurston, Esqr.
Percy Brown, Esqr.
C. L. Burns, Esqr.
Dr. A. Mitra.

The Sub-Committee reported as follows and their report was adopted by the Conference unanimously :—

The Sub-Committee consider it desirable that the publications on Art—Pure and Industrial—made in India should be unified. The publication should take the form of a serial edited and conducted in a way similar to the *Memoirs* of the Geological Survey, Zoological, Botanical and Archæological departments.

The Provincial monographs on Industrial Arts and the Technical Art series published by the Survey of India should be absorbed. From the serial extra plates might be easily struck off for the use of Schools of Arts and for other purposes.

The Committee believe that the present system, by which the Provincial Governments are asked to write monographs on specified subjects, cannot much longer continue, because the subjects common to most of the provinces have now been exhausted, and further the Committee believe that the Technical Art series find a far more extensive sale among European visitors to India than among the class for whom it was intended. The class to which these visitors belong would be more easily reached by a serial than they are by the present publication, while the artisans should be reached by pattern books through the Schools of Art. The serial would form the basis from which the designs of the pattern books should be taken.

The following resolutions were passed as regards the publications of scientific results, in each case unanimously :—

1. That the "Records" and "Memoirs" of the Geological Survey shall be the recognized official medium for the publication of scientific geological work in India, the "Records" and "Memoirs" of the Indian Museum for that of zoology, and the publications of the Botanical Survey for that of botanical work, the "Records" in each case being devoted to shorter papers and notes, and the "Memoirs" to more detailed monographs.
2. That in every case the size of the "Records" shall be super royal octavo ($11\frac{1}{2}'' \times 7''$).
3. That in the "Records" each paper shall commence on a separate page.

Fourth subject—moved by MR. I. H. BURKILL.

"Disposal of type specimens and registration of new specimens."

I. *Mr. Burkill* opened the discussion by explaining the meaning among scientists of the word "type specimen" as a specimen used for an original

scientific description, and by means of which alone the accuracy of that description must in future be tested. He pointed out the importance of preserving these specimens as references for (as nearly as possible) all time. Science needed that they should be both carefully preserved and accessibly preserved. Nothing had yet been done among scientists by common consent towards gathering types together into central institutions, that they may be preserved well in both ways; but it was very reasonable to enquire what could be done; and possibly in India biologists were in a far better position to achieve something than they were in many countries. Mr. Burkill in illustration proceeded to state that all types of plants which fell into his hands were not preserved by him in his own section of the Indian Museum but were made over to the Royal Botanic Gardens, Calcutta, which he regarded as the appropriate depository for them—it being the chief centre of work on descriptive Indian botany.. The convenience of the greater number of workers, and therefore the greater advancement of science, was secured by transferring them.

Similar principles might guide one in the disposal of all type specimens.

Regarding the registration of type specimens, the general rules of registration of the institute where they lie should apply.

Regarding registration in general, though there were Museums where the quantity of specimens received render registration by numbers impossible, *e.g.*, herbaria, there were more Museums where registration by number is desirable. If registration by number was impossible, something about the label should exist by which a particular specimen could be recognised, *e.g.*, if it becomes a type, the word "type" should be written on the label as is done at Kew. He suggested that, for the purpose of the Conference perhaps, these exceptional cases might be neglected. Registration of specimens should never be by any complicated method: one serial running number should alone be used for the objects to be registered, and the specimens and its number should never be separated: there should not be sub-numbers. The first act on the receipt of a specimen was its registration. In the Industrial Section of the Indian Museum, three registers were kept: one, now with running numbers from 1 to 10,469, recorded all the receipts for the Ethnological Gallery, a second with running numbers from 1 to 12,862 recorded all the receipts for the Art Gallery, and the third with running numbers from 1 to 28,170 recorded all the receipts for the Economic Gallery whether shown in it or reserved with the possibility of being shown in it. No specimen was unpacked from the package in which it came without at once receiving a label bearing its number or having the number painted on it; and the label or number always remained on the specimen, the label being often wired to the object if Artware or something Ethnological, or attached in suitable ways if Economic.

Correspondence about each specimen bore the number of the specimen also, and could be sought out without any doubt.

II. *Mr. Holland* dwelt on the importance of "types," and argued that, in order to prevent the possibility of different Curators exercising their own views as to the importance of such specimens, types should be stored in a Museum governed, if possible, by a representative body of Trustees, or at any rate, regulated by rules that could not be broken to suit the idiosyncrasy of each Curator who might be "acting" in charge. In India, practically all the types that had been established in Natural History subjects were stored in Calcutta—botanical specimens at Sibpur, zoological and geological specimens in the Calcutta Museum. An effort should be made, when the staff permitted it, to publish a list of the types available, in order that outside naturalists might know where they can be consulted. The collections of fossil-types preserved in the Geological Survey office were separately numbered and registered, being kept apart from the rest of the Museum specimens. The register showed the names of the species, locality, geological formation, author of the species and references to the description and published figures.

Mr. Holland also recommended very strongly that all specimens received at any Museum should be registered immediately on receipt, and special registers should be kept for the purpose. Such registers should only re-

cognise a classification that could be carried out accurately by a clerk without a special knowledge of any branch of science; for instance, anyone would ordinarily be able to divide the materials received into plants, animals, rocks and minerals, fossils, archæological specimens, coins, pictures and objects of industrial art. It would be unwise to arrange for any more precise classification in the preliminary register.

It was very common in most of the Museums in the world to come across quantities of material about which the history was doubtful, and most of such cases were due to the fact that some time during the history of the Museum the specimens and their labels had become confused. If immediately on the receipt of a specimen it were given a registered number, and that number were marked on it indelibly (either painted on or attached in the form of a metal label), the full details obtained up to the time and entered into the register might at any later date become of priceless value to the original worker. Nothing was so annoying to the worker as to have a doubt about the origin and history of the specimen which proved to be of scientific interest. It was better to be on the safe side and to record full details regarding specimens that might turn out to be unimportant than to run the risk of finding many years later that a specimen of scientific value could not be turned to account because of some flaw or gap in its history.

The registration of new specimens on receipt should not be undertaken by a scientific officer. He was far too inclined to subdivide the materials and classify them, and he was also inclined to be guided by his ideas as to what might be important and what might be useless. It was far better that the preliminary registration should be done by a simple clerk, in order that every known detail might be recorded. For this reason the speaker advocated the simple classification into the large groups referred to above, as this was possible for anyone with the most superficial education.

III. *Dr. Annandale* stated that although he was naturally in favour of making the collections in the Indian Museum as complete as possible in respect to the fauna of India, he was of the opinion that it was impossible, in the climate of Calcutta, to prevent degeneration in specimens of certain groups of insects, especially butterflies and moths, and that it was more important that a "type" should be kept safe and be accessible for study than that it should be kept in Calcutta. He would therefore recommend that in the case of such specimens as it was impossible to preserve safely in Calcutta the type should be sent to the British Museum in London. He believed, however, that it would ultimately benefit everyone concerned if Indian types were as a preliminary sent to the central museum of the Indian Empire, in which the great majority of them could be preserved safely and permanently.

IV. *Sardar Sahib Bhai Ram Singh* (Punjab) was of the opinion that type specimens should be disposed of according to the instructions as regards coins issued by the Government of India recently, and that their registration in the catalogues distributed for the information of workers would be very useful and important. The registration of new specimens was decidedly most essential. Registers maintained for this purpose should be uniform in all the Museums of India.

In connection with this debate the following resolutions were passed unanimously:—

1. That all zoological "types" in India shall be deposited in the Indian Museum, but that the Superintendent of the Natural History Section shall be empowered, with the consent of the Trustees, to transfer to the British Museum (Natural History) such entomological "types" as may be, in his opinion, in danger of destruction owing to the climate.
2. That all Palæontological "types" shall be placed in charge of the Director of the Geological Survey, and all Botanical "types" in that of the Director of the Botanical Survey.
3. That in each case either a duplicate, a drawing or a photograph of the type shall be sent to the institution from which the original specimen was obtained, and that the "type" itself may be lent for scientific examination to this or other institutions if it can be sent with safety.

4. That it would be useful that lists of types should be published periodically.
5. That all specimens received at any Museum shall be entered in a general register as expeditiously as possible and that the register shall be divided into volumes representing the main sections of the collection in such a way that the ordinary clerk can appreciate the differences between these sections at sight and with no possibility of confusion. The following eight headings were aprpoved as being suitable for the collections of a provincial museum :—
    1. Archæology and Epigraphy.
    2. Coins and Medals.
    3. Art and Ethnology.
    4. Economic Products.
    5. Geology.
    6. Plants.
    7. Animals.
    8. Books, Maps and Manuscripts.

Fifth subject—moved by MR. T. H. HOLLAND,

"Classification of public exhibits and reference collections."

I. *Mr. Holland* explained in opening the discussion on this question that it was placed on the list of agenda of the Conference in consequence of the bearing it had on the reorganization of the Indian Museum now being considered by Government. In the institution known to the public as the Indian Museum, there were, in fact, two independent organizations :—

(*i*) the geological collections, which were part of the property of the Geological Survey and administrated by the Director, who was responsible directly to the Government of India;

(*ii*) the exhibits relating to industrial art, archæology, economic products, zoology and ethnography, which were administrated by a body of 21 Trustees constituted into a Board by a special Act in Council, which gave the Trustees powers somewhat similar to those of a Local Government.

The question had recently been raised as to whether the various subjects under the administration of the Trustees could not be conveniently divided into natural units, such as (*a*) zoology and ethnography, (*b*) art, (*c*) archæology and (*d*) economic products, and whether, as regards purely technical and scientific questions internally, the Superintendents of these sections should not be given the power now possessed by the head of the geological section. At present the part of the Museum under the administration of the Trustees was divided into two sections, the Superintendent of the Natural History Section having charge of the archæological exhibits as well as the zoological collections, while the Superintendent of the Industrial Section has charge of ethnography, industrial art and economic products. It was obvious that the grouping together of subjects so utterly unrelated as archæology and zoology could not tend to efficiency, and it was obvious that, if financially possible, such unrelated collections should be managed by separate officers. Most people would concur on this last point, *viz.*, that separate specialists should be in executive charge of distinct subjects, whenever a Museum is large enough to command the full services of specialists for each natural subdivision. It was, of course, necessary in small Museums, for financial reasons alone, to group together several subjects under one officer; and as far as India is concerned, most of the Provincial Museums could not afford to pay for more than one superior officer for the whole Museum; but the Calcutta Museum was now too large and too important to be treated in this way. The Provincial Museums had as their main object the education of the public, and an attractive display of natural objects must be their chief aim. In the Indian Museum, however, there had now been accumulated an enormous mass of material suitable for reference purposes, and the collections had become so large that no original worker in palæontology or zoology could afford to neglect their value. Thus the leading function of the Indian Museum should be its use as an instrument for serious scientific research. Its popular side should not be neglected, but, in administration, we should

regard, first of all, the scientific efficiency of its officers rather than their ability to make popular displays. This being admitted, many would argue that it would be unwise to place the Museum under a single Director who would have control of the zoologists, the archæologists and the geological officers. If such a Director had no special or scientific qualifications, he would not be fit to criticise the scientific work of any one section. If, on the other hand, he were a zoologist, no matter how distinguished, he would not be fit to control the research work in the archæological section; or, if he were a geologist, he would have no right to interfere with the purely scientific problems of the zoological section.

Admitting, therefore, that scientific work and research form the chief object of the Indian Museum, it seemed advisable to give each specialist a free hand so far as his own particular collections were concerned; and with this aim in view, proposals had now been made before the Government for dividing the Indian Museum into the following sections:—

(*a*) Art.
(*b*) Archæology.
(*c*) Geology.
(*d*) Zoology and Anthropology.
(*e*) Economic Products.

All these sections except zoology and ethnography could be linked to existing Departments of Government, and it was proposed that such departments already concerned with the scientific aspects of the questions should be responsible for the internal administration of the corresponding sections of the Museum. Zoology and Anthropology would be under a separate Superintendent responsible directly to the Board of Trustees, whose other functions regarding the Museum would be purely advisory. The Trustees would not attempt to interfere with purely scientific matters in any section, but they would be the guardians of the public: it would be their duty to see that the public exhibits were suitably displayed, that the rules for the admission of visitors and their control were properly carried out, and that the buildings and compound were kept in decent order.

This new organization would be applied to the various collections grouped together in one set of buildings such as we have for the Calcutta Museum, or it could be applied to separate Museums, if, in future, it be found impossible to accommodate in the space now available the full grown collections.

Generally it was convenient to have the Museums either in one building or in a series of buildings near one another; but personally the speaker did not consider it important that all subjects should be exhibited in the same Museum. The visitor to a Museum, with serious intentions to study, could not take an intelligent interest in more than one or two questions: if he was a zoologist, it was not likely that it would be greatly to his advantage to find a number of archæological exhibits in the same building; conversely, if he was an archæologist, he would not care whether the minerals and fossils were in the same part of Calcutta or were exhibited elsewhere. However, there was a large number of uneducated public who wanted to see as much as they could of things curious, and although, possibly, the satisfaction of their feelings of curiosity could not be regarded as education, they had a right to be considered, and possibly a right to expect as many subjects as possible concentrated in a convenient set of accessible buildings. The sub-division into natural units, and the independence of the units, as far as internal scientific questions were concerned, were points in Museum organization that were seldom exemplified in the larger Museums of Europe; but it should be remembered that most of the large Museums in the world had grown gradually to their present dimensions by the accretion of legacies and bequests that were generally tied up with special conditions. The vested interests in these old institutions were so strong that it was now impossible to break loose from the administration under which they had gradually grown, in order to adopt a more scientific and more natural subdivision of functions. In Calcutta, to a certain extent, the Museum was also tied up by the linking

together of different institutions, but most of these were at the disposal of Government and it was consequently comparatively easy by a modification of the Act in Council to effect a reform for the purposes of adopting a more scientific classification in administration.

Luckily those concerned were not compelled to take this new step on purely theoretical considerations; the geological section had been independent of the rest of the Museum from the beginning; the Trustees had not even advisory powers with regard to it; yet no visitor would notice, on passing from the invertebrate gallery to the mineralogical gallery, or from the archæological wing across the hall into the Siwalik gallery, that he was entering a totally different institution. As regards the display of material for the public, as regards the hours of attendance, as regards the uniform of the attendants, the two institutions had adopted similar regulations, and so far as the public were concerned, the two were one; yet the Trustees had no right to enter the geological galleries except as members of the public. They had no control over the classification of rocks, minerals and fossils, and had no say in the purely scientific problems involved; but no one can say that the geological section had been less successful either from the scientific or the public point of view than any other section of the Museum. What had been found to be practicable and successful in connection with geology should be possible also if zoology were divorced from archæology or if art were separated from botanical products of economic value. They were therefore not adopting a radical change without a successful experiment to guide them.

Now that the system of grouping and administration of the chief sections of the compound museums had been considered, the next point to consider was the internal classification that might be adopted in a group. In a small museum, with a limited number of specimens, it was found possible to adopt one classification only. In a large Museum with numbers of duplicates available, two or more classifications might be possible to express the different aspects for the same subject; for example, it might be convenient in a Provincial Museum to exhibit geological specimens by districts only instead of according to recognized scientific classification of geological materials. With duplicates available it would be possible to display two series—one according to the subject classification and another according to the geographical classification. The same question arose with regard to ethnography. We could group together all the different kinds of weapons to form one collection, the different kinds of musical instruments to form another, the various sorts of dresses and personal ornaments to form the third, thus permitting of a comparison of the dresses of the different tribes, of the musical instruments, or of the weapons they use. In so far as such a classification would express the evolution of the articles represented, it would be one of scientific value. On the other hand, the ordinary visitor of the Museum and the new comer to the country would be generally more interested in a particular tribe or in a limited number of tribes. He would thus prefer to see representative models of the tribes surrounded by the materials they make use of—their dresses, their weapons, their fishing nets, musical instruments, and, in fact, all the materials that show the nature of their life. This classification was utterly different to the first, but it might be convenient, if sufficient materials were available, to have both forms of classification in the same Museum.

It was not possible to lay down a law suitable for all types of Museums. The classification to be adopted must depend entirely upon the nature of the material available. In the case of the Geological Museum in Calcutta, where abundance of material was available, two classifications were adopted for each subdivision of Geology; for instance, the minerals were arranged in one series of cases according to a recognized scientific grouping, while in another set of cases they were displayed in accordance with their economic uses. In the first series, would be found the oxides of iron associated with the oxides of alumina, chrome and manganese, and the carbonate of iron would be associated with the carbonates of lime, baryta and magnesia, while the sulphides of iron would be associated with those of copper, lead, zinc,

silver, etc. In the economic series, on the other hand, would be found together the oxides of iron associated with the carbonates, forming a series of minerals suitable as sources for the manufacture of the metal. So, also, would be found together the carbonate, sulphide and oxide of copper as materials which could be developed for the economic production of copper. At the same time, in the economic series, the minerals might occur in more than one place; for instance, while some forms of hematite, *i.e.*, oxide of iron, were suitable as pigments, they would be found associated with substances like barytes, zinc-white, white lead, graphite and other substances also used as pigments, while duplicate specimens would be found with the ores of iron suitable for smelting the metal. In the case of fossils, one series was arranged zoologically; the cephalopods of all ages would be found in one group of cases separated from the gastropods. In another series, the fossils were arranged in accordance with their geological age, and we would thus find the cephalopods and gastropods of the same geological period grouped together. Rock specimens were similarly arranged according to their stratigraphical classification, and according to their lithological nature, into two distinct series. The ideal Museum would give expression in its collections to every aspect of the subject concerned; but the ideal could not be approached when financial limitations only permitted of the formation of an imperfect collection. Thus, we might be limited, as in most Provincial Museums, to the display only of one aspect of a subject, while in the Calcutta Museum we were generally limited to two, and it could not be regarded as unsatisfactory if the two principal aspects of any one subject were suitably and fully displayed in the Museum.

II. *Mr. Brown* (Punjab) said that collections should be classified into a number of broad divisions so that on the arrival of any particular article in a Museum it would be possible for a subordinate to refer it correctly to the broadly defined class to which it belonged; its ultimate exact location being afterwards decided upon by the expert officer in charge of that particular class.

In the Lahore Museum the various departments were at present in the process of classification, the classes now completed being—

1. Industrial Arts.
2. Fine Arts.
3. Archæology and Antiquities.
4. Coins.

The other departments of the Museum were under arrangement and it was proposed to classify these according to the methods adopted by the Indian Museum.

With regard to the four classes enumerated above these had been subdivided as below:—

1. Industrial Arts.
   - (*a*) Hardware manufactures.
   - (*b*) Textiles.
2. Fine Arts.
   - (*a*) Pictures, Photographs and Engravings.
   - (*b*) Sculpture and Statuary.
3. Archæology and Antiquities.
   - (*a*) Sculpture (Græco-Buddhist, Brahmanical, Jain, Muhammadan, etc.).
   - (*b*) Inscriptions.
   - (*c*) Prehistoric Implements.
   - (*d*) Miscellaneous including antique jewellery, seals, etc.
4. Coins.
   - (*a*) Ancient Coins (Græco-Bactrian, etc.).
   - (*b*) Muhammadan.
   - (*c*) Miscellaneous.

III. *Mr. Ibrahim Rahimtoola* (Bombay) dwelt on the fact that few or no local Museums in India would be able to afford the expenses of putting different sections of their collections under different experts. He agreed, however, that the proposals made as regards the Indian Museum would prove beneficial in the case of a central institution with relatively large funds at its disposal.

IV. *Sardar Sahib Bhai Ram Singh* said that collections must be divided into various classes. There should be a certain number of main heads, which should be classified into sub-heads. Every effort should be made to exhibit the collections of a museum in their proper sub-heads. This would facilitate the control as well as the location of exhibits.

The following resolution arising from the discussion was put to the meeting and passed unanimously :—

> That the Conference expressed their approval of the scheme for splitting the Indian Museum into sections as proposed by the Trustees and were of the opinion that the principles involved were the best so far as the central museum for India was concerned.

Sixth subject—moved by MR. I. H. BURKILL,

> "*Preservation of specimens and labels specially suitable to the climate.*"

I. In introducing the sixth subject, *Mr. Burkill* laid on the table examples of the labels used in his section of the Indian Museum. The important labels, *viz.*, those referred to under the fourth topic, were not those intended for the use of the public but were kept at the back of the specimens: those for the public were as small as was compatible with legibility and were renewed at frequent intervals. For the purpose of renewal they were printed by the fifty at a time. Two examples are given here :—

Caryota urens, THE SAGO PALM Vern.—*Mari* (HIND.); *Birli-mhad, birli mhar* (BOM.); *Conda-panna, erimpanna* (TAM.). Dictionary, C. 711. Reg. No._____ Museum Cabinet No. 205.	*Section* No. MASULIPATAM.

The work of renewal of the labels was done by a duftry under the supervision of a clerk and the perpetual original number was always on the object or on a label behind the object as a reference for the avoidance of mistakes.

For the preservation of temporary labels, therefore, no particular care was taken. All—both perpetual and temporary or show labels—went discoloured in the strong Indian light in a very short time; but the show labels were frequently renewed.

For the preservation of the specimens in the Industrial Section of the Indian Museum great care was taken. Spirit, naphthaline, creosote, corrosive sublimate, carbolic acid and kerosine were all used. Spirit was used in the usual way for the preservation by immersion of fruits, etc. Naththaline was put into every show case—a dozen pieces—the size of a marble, being for the purpose tied up in a bit of muslin; and several such bundles being put into each case: it was put also into every index tin, where unfortunately it at times caused a little trouble by subliming on to the glass front of the tin. Creosote was washed annually over the backs of all large pieces of timber where they were in contact with walls and were allowed to soak in; it was not used for other purposes. Corrosive sublimate was used for all dried seeds, leaves, bamboos and softer parts of vegetable origin. It was made up in a concentrated solution in spirit and poured over the material to be poisoned, or washed over it with a brush, and allowed to dry so that they get a thin coating of it. Next to naphthaline it is the most used preservative.

Carbolic acid was put into all glue used. Kerosine was used for the impregnation of card board boxes and books that book-worms had begun to attack.

There were many enemies to guard against:—mice which were best kept down by trapping, fish insects which at present did little harm to other things than paper, the bamboo shot borer which get into articles both in the Economic and the Ethnologic courts, the longicorn beetles which attacked timbers, white ants, grain-weevils, book-weevils, grain-moths, etc. Mr. Burkill explained that, with the assistance of these poisons and preservatives, he relied firstly however upon cleanliness, frequent dusting and as far as possible the avoidance of dark corners.

II. *Dr. Annandale* gave particulars as regards the preservation of cottonwool saturated in the Indian Museum. He pointed out that such specimens might, as specimens, be considered conveniently under two heads, (*i*) dry specimens and (*ii*) specimens preserved in liquid. The most important of the former were dried insects and skins of birds and mammals.

As regards insects he would recommend the use of silver pins and that all boxes or cases should be provided with a receptacle for a sponge or piece of cottonwoon saturated with carbolic or creosote. Camphor might also be used, but he was doubtful as to the practical utility of naphthaline in insect boxes. He was against the use of cards in pinning delicate insects, but would recommend small slabs of cork or pith, which had the advantage over cork of being very easily obtained in India. The slabs should be large enough to protect the legs, wings and antennæ of the insects pinned on them and should be oblong, not round. The use of card disks, although it was recommended by the British Museum, was a mistake when there was any chance of the specimens having to travel. The pin, too, except in very delicate insects, should be inserted from above, not from below. Very minute specimens were best pinned sideways from below. Insects should also be protected, so far as possible, from light; but he was doubtful whether it was possible in India to prevent butterflies and moths from fading, even if every precaution was taken.

As regards mammals and birds, they should always be preserved in the first instance as skins, unless they were wanted for purposes of anatomical research. The instructions given in the British Museum, hand-books might be followed as regards the preparation of skins. As regards the preservation of stuffed animals in the public galleries of an Indian Museum, he would recommend the course followed in Calcutta. The cases at present in use were unsuitable for any climate. Still, one had to make the best of them, and museum cases were extremely expensive if made properly. Even with the bad cases, however, which were all the Indian Museum could afford, it was possible to keep the stuffed animals in a fairly good state of preservation for a considerable number of years. Sulphur was burnt in the cases periodically and the mammals were rubbed over with clove oil. Saucers of unslaked lime, to absorb moisture, were placed in them, and of naphthaline. The latter substance probably kept out the larger and more delicate insects such as cockroaches and "fish insects" (Thysanura), but it was useless against mould or other microscopic pests and probably also against noxious beetles.

As regards specimens preserved in liquid, he found strong alcohol the only satisfactory medium as a permanent preservative. Softer animals, such as fish, frogs and most marine invertebrates, except crustacea and echinoderms, were benefited by a preliminary hardening in a solution of formaline. This drug, however, sooner or later destroyed any tissue containing salts of lime and had proved unsatisfactory, owing to the evaporation of its essential constituent, as a permanent preservative in the climate of Calcutta, even for the softest organisms. Soft specimens should be put in formaline for one week and then transferred to spirit; but if they were very delicate they might first be transferred to a very weak mixture of alcohol and water, then into a stronger one, and finally into one containing not less than ninety per cent. of alcohol. Sponges should always be preserved in the strongest alcohol available. A great danger in Calcutta was the absorption of water vapour by the alcohol, and it was necessary to be continually renewing and redistilling the alcohol, even when the best stoppered bottles were used. A mixture of country soap, boxes-wax and cocoanut oil was

always placed round the stoppers of bottles in the Indian Museum, but this did not prevent the alcohol from becoming gradually weaker.

As regards labels, the only ones he found really satisfactory for exhibition purposes were painted by hand on wooden boards. It was necessary that the wood should be well seasoned. It was then covered with black enamel and the legend was painted on it by a markman, who was employed for the purpose. The rule now was in the Indian Museum that labels for animals occurring in the Indian Empire were painted in white, and for those that did not occur within its limits in red. As regards field labels, the instructions given in the British Museum hand-book might be followed.

III. *Mr. Thurston* (Madras) observed that, though naphthaline was largely used as a preservative in the Indian Museum and Madras Museum, nothing was really known as to its efficacy, which was accepted very much on trust. He suggested that a systematic series of experiments should be carried out, with a view to ascertaining how far it is efficacious in preventing the ravages of insects and other museum pests on labels, animals, textile fabrics, etc.

IV. *Mr. Brown* (Punjab) said that the principal enemies that the Lahore Museum had to contend with were white ants and dust. With regard to the former all wood not under direct observation, such as the backs of cases, etc., was coated freely with coal tar. The dust of the Punjab was, however, a very serious and ever present difficulty and could only be prevented by means of air-tight and dust-proof cases.

V. *Sardar Sahib Bhai Ram Singh* (Lahore) thought that every precaution should be taken by the curators and their staff to protect the collection from dust, white ants, and other noxious worms and insects. In the Lahore Museum an excellent arrangement was made for this purpose. Air-tight glass fixture cases glazed with glass plates were provided in the sculpture gallery. The backs of these cases were well coated with coal tar and about one inch of room was provided between the wall and the back of the cases. This was always filled in with sawdust mixed with tar, through which kerosine oil was poured whenever there was any danger from white ants. To furnish other Museums with such like cases would most certainly protect the collection to a great extent. Naphthaline should also be kept in cases. Labels might be printed with particulars of the objects and on paper and covered with glass as in the Indian Museum. This system was suitable to all climates. In the Lahore Museum labels were printed on black japanned wooden plates.

VI. *Dr. Mitra* (Kashmir) called attention to the use of the root of *Saussurea Lappa* ("Kut") as an excellent preservation of woollen fabrics, furs, and feathers. It was largely used in Kashmir and he had found it as good as naphthaline if not better in some respects.

In regard to this subject the following resolution was proposed and passed unanimously:—

1. Dr. Annandale and Mr. Burkill were requested to incorporate their remarks on the subject of the preservation of specimens in a note and to circulate them to the different Museums. They were also requested to conduct systematic experiments on the effect of naphthaline in preserving specimens of different kinds from the attack of insects.

Seventh subject—moved by Mr. E. Thurston,

"*Recognized special functions of particular Provincial Museums.*"

It was agreed on the proposal of the Chairman that for the purpose of discussion the term "provincial museum" should be held to include a Presidency and State Museum.

I. *Mr. Thurston* (Madras) in opening the discussion said that, in his first annual administration report of the Madras Government Museum, after he took over charge of it in 1885, he made the following remarks: "It is wholly beyond the power or scope of a Presidental Museum to rival the great

national museums in the possession of representative collections from different quarters of the globe, and I have determined to devote my entire attention to the natural history, arts, ethnology, manufactures and raw products of Southern India, accepting only such specimens from other regions as may be sent as donations from time to time, and keeping them entirely apart from the main collections. The necessity of such a course is best illustrated by reference to the geological collection, which, while abounding in a chaos of purchased and exchanged specimens of European fossils, is markedly deficient in specimens from the rich fossiliferous beds of the Cretaceous system of Southern India." He had nothing to add to, or take from this. The policy laid down had been steadily followed, with some measure of success. Sir William Flower, formerly Director of the British Museum (Natural History), once observed that "a museum depends for its success, not on its building, not on its cases, and not on its exhibits, but on its Curator." The provincial museums could not expect to be provided, like the Indian Museum, Calcutta, with a body of specialists in Zoology, Geology, Economic Products, etc., and it was, therefore, essential that their Curators should be men possessed of wide sympathies, and capable of undertaking, to the best of their abilities, the working of various departments, in such a manner that one was not developed at the expense of the others. At Madras, Mr. Thurston had been responsible for the appointment, in recent years, of specialists as Honorary Assistants to the Superintendent in the Natural History and Archæological sections. He strongly recommended the Curators of other Provincial Museums to adopt the same course, as they would in this way receive assistance from men who would be willing to give much valuable help, if they felt that they had a definite position on the staff.

II. *Dr. Kanga* (Baroda) stated that a museum should not confine itself to the arts and industries of the particular place but should have a collection of typical specimens of all sorts of arts and industries from all countries, specimens of fine and applied art which could be advantageously imitated by Indian artists and craftsmen.

III. With regard to several important departments of a Provincial Museum, *Mr. Brown* (Punjab) thought that to display only local examples was a mistake, particularly in the departments of Industrial Art. In the case of any local art, as for example enamelling, he found it extremely useful to exhibit, along with a comprehensive collection of local examples, specimens from other parts of India, and even to go further afield and display types from Europe and Japan. The object of this was obvious; the visitor, aware of this local art and wishing to study it, would see in which way it resembled or was different from types produced from other centres where this particular industry was carried on; in the same way the workman in the art of enamelling might not only see specimens of work of his own province but might learn something from the methods employed by his brothers in the craft in other parts of India and abroad. Referring to the collection of antiquities, attention might be drawn to the policy of the Archæological Department regarding inscribed stones, etc., displayed in a Museum but evidently originating from some district outside the Provincial arear of that Museum. In cases of this kind the Archæological Department requested that the specimen might be transferred to the museum nearest to its place of origin, and arrangements were always made for this to be carried out. In this connection it might be mentioned that the Municipal Museum at Delhi had been closed, and an historical Museum opened at Delhi Fort by the Archæological Department, in which had been placed objects of local historical interest taken from the discontinued Municipal collection. Application had also been made to Lahore for an object of local historical interest now displayed in the Lahore Museum to be transferred to the Delhi Fort. Further, at the request of the Archæological Department, inscribed stones had been sent from the Lahore Museum to Lucknow and also to Muttra, as it was pointed out at the time that these particular specimens had direct reference to those places but no connection with the province in

which they were then displayed. The policy was on general principles, a most commendable one, but the extent to which it should be actually put into effect might be a matter of consideration for the Conference.

This subject had some bearing on the number of Museums that it might be considered advisable to maintain in various parts of the country. Generally speaking, there should be one and not more than one in each Presidency, Province or State. Exceptions to this rule might be desirable in the case of small historical or archæological museums in special localities as put into effect at Delhi and Muttra by the Archæological Department. It might also be found useful occasionally to establish small trades or industrial art museums in towns where specially important manufactures were carried on, but it might be mentioned that these as a rule did not effect their purpose and usually deteriorated for want of support. The only way to maintain these small local collections would be to link them up with the Central Museum and have them supervised and inspected by the staff of that institution.

IV. *Mr. Burns* (Bombay) said the discussion raised the question of the functions of all Museums, in regard to which it was very difficult to lay down one law applicable to Museums devoted to all subjects.

He agreed with those members of the Conference who stated that a Science Museum should be a depository for records referring to the branch of science which the Museum is intended to illustrate, and especially for those records found in the country in which the Museum is placed. The Indian Museum broadly carried out that function for the whole of the Peninsula, and in his opinion the Provincial Museums should work upon similar lines, and illustrate the Fauna, Flora, Geology, Archæology and Ethnology of the particular province or state in which they were situated in more detail than is possible in a Central Museum, however large. There was a function of an Art and Applied Art Museum which did not lend itself to this restriction of field. An Applied Art Museum to be of real value should in his opinion not only be a place of record of the artistic industries of the Province, but should in addition be regarded as a necessary portion of the teaching equipment of the School of Art.

With this in view, it was obviously requisite that side by side, with each set of exhibits of a local Artistic Industry, should be displayed the best specimens of similar work from other parts of India, from Europe and Japan. India is now flooded with a large quantity of the worst work produced in both Hemispheres and illustrated catalogues of an equally low artistic level. Both work and drawings in catalogues are copied by the crafts people of India, who have no traditional designs for many of the articles now in demand. It was therefore of great importance to the future that these craftsmen should have the opportunity of seeing the really fine work now being done in foreign countries, and copies at least of the best work of the past.

He thought it would be quite possible for the Indian Museum with the help of the Government of India to make a series of small but thoroughly representative collections of works, each collection containing originals or copies of the best specimens of some particular artistic craft common to the civilized countries and throughout the world, and produced at different periods. Such collections of comparative examples could be circulated on loan to Provincial Museums or Schools of Art in States or Provinces where the craft illustrated is extensively practised, where they would be of great educative value to the Art workers of the District or Province.

For instance a collection of gold and silver articles for the table or for personal adornment, exhibiting the best work of different parts of India, and in addition reproductions of Greek, Roman, Mediæval, and Modern European and Japanese articles of a similar character, would be of the greatest value in exhibiting the comparative merits of each style, and would give the craftsman a wider knowledge of his craft than is possible at present. Electrotyping and other methods of reproducing original works are now so comparatively cheap, that the formation of such collections could be made without a very great outlay, while the experience gained by the

circulating department of the Victoria and Albert Museum at South Kensington, would supply ample data regarding the organization of a similar department at Calcutta.

It would require a separate head to the department if it was to be successful, and a staff to arrange for packing, etc. With regard to Archæological collections, he thought the rule should be that the Indian Museum should contain one or two of the finest specimens from every part of India, while Provincial Museums should exhibit in greater detail those records of the races who formerly inhabited each Province. When an isolated Archæological specimen was found which supplied a missing link in the collection at the Indian Museum, he thought its place was in the Central Institution. When several were found, the best specimens should likewise find a home there, while the remainder should go to the Provincial Museum. These views might not be regarded with favour by some Curators, but he thought that they were in accordance with the sound principle which should guide the relations between the Indian Museum and those of the Provinces.

V. *Sardar Sahib Bhai Ram Singh* (Punjab) said that it would be more useful if works of other provinces were also displayed along with that of a particular provincial museum. This would help the workmen as well as the visitors to find out the difference between the work of the particular province and that of others. It was strongly recommended that the collections of antiquities might be displayed in the museum nearest to their place of origin. This arrangement of the Archæological Department deserved appreciation.

After considerable informal discussion, the following resolutions were proposed to the meeting and passed, the first two by a majority, the third unanimously :—

1. That the provincial museums of India should in the main confine their scope to the presidency, province or state in which they are situated.
2. That in the opinion of the Conference, it is desirable that in every province or state there should be but one Government or State public museum.
3. That the officers of every provincial museum should have direct access to a good reference library, and that this library should whenever possible be connected with the museum.

Eighth subject—moved by Mr. E. Thurston,

"*The preparation of guides for the public.*"

I. In opening this discussion *Mr. Thurston* (Madras) said that it was a well-known saying that the labels in a museum gallery should be in great measure a guide. Of this there was an excellent example in the reptilian section of the Indian Museum, which the members of the Conference had visited. There could be no possible doubt as to the advisability of issuing guide-books, written in popular and attractive style, and well illustrated. The preparation of such guide-books should be entrusted only to those possessed of special knowledge of the subjects dealt with. Personally, he had some years ago issued a guide to the Natural History section of the Madras Museum, but very varied duties had prevented him from re-writing it, and bringing it up to date. The question whether guide-books should be issued in vernacular languages struck him as one which might be discussed.

II. *Mr. Ibrahim Rahimtoola* (Bombay) said that he regarded the preparation of guides to the collections of a museum as very important. He did not agree that such works should only be prepared by expert Museum officers but was of the opinion that they should be compiled by any competent person. He regarded it, however, as a very important part of the duties of a Museum curator to prepare guides and catalogues as regards the collections in their charge.

III. *Sardar Sahib Bhai Ram Singh* (Punjab) was of the opinion that it would be a great help to the visitors and would be much appreciated by the

public if guides were published in the vernacular of the provinces. Vernacular publications would be a great boon specially to the artisans who were generally quite unacquainted with the English language but were in great need of learning the descriptions of artistic collections. As far as possible the vernacular guide-books should be issued free of all cost or must be so priced as to fall within the means of the artisan classes. To encourage the artisans guide-books should be sold to them at half the price charged to ordinary visitors.

IV. *Mr. Burkill* objected to the proposal that guides should be required from the pens of Curators; it would be sufficient if they were required from competent authorities chosen by those responsible for the Museums. Their preparation should not be a first duty of the Curators.

V. *Mr. Brown* (Punjab) said that in connection with the Lahore Museum a series of guide-books were being prepared with the object of assisting the ordinary visitor to understand and appreciate the collections of objects displayed in the various departments of the museum. Each handbook would cover one particular department such as Archæology or Industrial Art and would contain a brief reference to the collection generally, together with a detailed account of a certain number of the most remarkable examples. The books would be printed in English, would contain a number of illustrations and be sold at the door for a few annas. They would take a purely popular form and were for the benefit of the intelligent visitor, either European or Indian, who wished to be supplied with a brief account of any particular department in which he was interested. With regard to a proposal that there should be publications in the vernacular it was felt that these were not required. The class of visitor which really desired information was that class which could usually understand English. This fact was brought to light in connection with a scheme for displaying labels in English as well as in the local vernacular. Those who could read the latter were generally sufficiently educated to read the former. A small price should be put on all guide-books. Pamphlets or similar productions issued free were generally not valued by the ordinary visitor.

After considerable informal discussion the following resolution was passed by a majority of 5 to 3. Several delegates did not vote :—

> That the preparation of guides and catalogues is eminently desirable provided that such works can be prepared by the officer in charge or by some competent authority. That the issue of guides in the vernacular languages is quite unnecessary.

Ninth subject—moved by MR. J. CAMERON,

"Art sale-rooms in connection with Museums."

I. *Mr. Cameron* (Mysore) said that Bangalore being situated in a pleasant part of India, the Museum was visited by a considerable number of foreign and monied people, who were often on the look-out for art curious such as are peculiar to Mysore. But his experience was that visitors of this class preferred to purchase articles on the spot and were chary of leaving orders behind them. It was thought at first that keeping a handy register of the names and full addresses of the principal artisans in the province would meet the requirements of the case, but it was not so, and some years ago it was permitted by the Darbar to open a small sale room in the museum where sandalwood carvings, inlaid work, lacquer work and such like could be sold for cash payment, the conditions laid down being that all articles were of the very best workmanship and that no profits were claimed by the museum authorities. At the start Government gave a little help, but now the sale room was practically self-supporting, as several artisans appreciated the advantage placed at their disposal and kept the room stocked with popular artware. Of course the whole business was on a very limited scale at present, and it was difficult to maintain workmanship of the highest quality when the artisans were engaged on special work for the Government or otherwise. As a rule they were not only limited in number but also widely scattered in a few remote villages or hamlets. The main object was to place good work within the reach of the buyer at original prices.

II. *Mr. Burkill* remarked that it behoved governments to be watchful for the encouragement of art, the artisans being never or rarely other than proletarians, unable to lock up capital in objects in order to offer them for sale.

III. *Mr. Brown* (Punjab) said that an Art sale room had been conducted in connection with the Lahore Museum for many years and the sales effected during the last five years had been as follows :—

1902-03	1903-04	1904-05	1905-06	1906-07.
Rs. 789-5-0	Rs. 1,330-5-0	Rs. 1,684-0-6	Rs. 2,023-8-6	Rs. 2,670-10-9.

The sale room was under the direct control of the Curator, who supervised the stocking of this department and arranged for the purchase of approved specimens of local manufacture for display in this room. Further, orders were registered for duplicates of any particular article or copies of any object exhibited in the permanent collections of the Museum. These orders were transmitted to workmen capable of carrying out the manufacture of the required article, which, when completed, was forwarded by the Museum office to the intending purchaser. This was one of the methods employed for conducting business in the Lahore sale room. Another branch of work was that of commission sale. Artisans were encouraged to bring approved specimens of their handiwork for display in the sale room of the Museum on the understanding that a small commission was charged on their sale. To bring the objects and advantages of the sale room to the notice of craftsmen and others interested, a circular had been issued and widely circulated by the Local Government. There was little doubt that this branch of the Museum was doing useful work, but it could be considerably improved and extended if it were properly staffed. To keep the sale room constantly stocked with approved articles required the whole time of an able man thoroughly acquainted with all the arts of the Province and also knowing the requirements of the would-be purchasers. With regard to the former, the sale room Superintendent would have to spend a great deal of his time in travelling about from one art centre to another arranging for purchases, superintending the manufacture of replicas and would give orders for articles which he knows from experience would find sale.

The Lahore Museum had not the staff to carry this work out properly, so that its sphere of utility was somewhat limited, but even in its present state a considerable amount of good was effected, and as the sale proceeds of the last 5 years indicated. With regard to the general principle involved in the maintenance of sale rooms in connection with Museums there were many objections to be brought forward. The principal objection was that they were competing with private enterprise and that their work should be left for the dealer to transact in his shop in the bazar. From the point of view of business this argument was incontrovertible but the artistic aspect of the case should not be overlooked. The dealer traded in every form of art workmanship, the good with the bad, and as often as not his stock consisted of the most popular and fashionable articles, which it would not be beside the mark to designate as frequently the least artistic and often the most degraded types of work. The dealer's object was business pure and simple and his stock was composed of articles gathered together for that purpose only. A sale room should however be conducted with a very different intention and it was felt that if maintained on proper lines it would not compete with private enterprise in the least degree. The main object of the sale room should be to bring to the notice of the purchasing public the very highest and best examples of local art industry; the matter of trade being a very secondary consideration as long as the concern were not run at a loss. A small but well conducted department with this intention would do a great deal towards maintaing the high quality of Indian Art, both as regards design and manufacture, and would further be a practical method of assisting the workmen to continue with their craft. Briefly the subject resolved itself into the question of, not "should sale rooms be maintained," but "by which

department should these sale rooms be maintained" and until this difficulty was satisfactorily solved Mr. Brown was of the opinion that some considerable good could be gained by associating them with Provincial Museums.

IV. *Sardar Sahib Bhai Ram Singh* (Punjab) said that the annual increase of sale proceeds of the Lahore Museum sale room indicated that this branch of the museum was achieving a great popularity every day. If it were placed in charge of an accomplished man having a knowledge of arts and specially well versed in book-keeping, assisted by a sufficient staff, it would no doubt do much good in maintaining the excellent quality of Indian Arts, as artisans would always be encouraged to turn out first class workmanship and would be given the necessary instruction and advice for that purpose.

V. *Dr. Mitra* (Kashmir) said that he was not in favour of having sale rooms in connection with Museums. The Museums could, however, do a great deal in encouraging and improving the Art Industries. In the Indian Museum there should be courts, where representative articles of all parts of India should be kept, for that would serve as a permanent exhibition of such articles.

A resolution proposing that Art sale rooms should be established in connection with provincial museums, in cases in which they did not already exist, was put forward but was negatived by eight votes to six.

Tenth subject. Certain questions as to details of Museum management put forward by the delegate from Baluchistan.

It was agreed that these questions should not be discussed at the Conference, as they could be settled better by a personal discussion with the Superintendents of the Indian Museum.

Eleventh subject—moved by Mr. J. W. N. Cumming,

"Financial aspects of Museums."

I. *Mr. Cumming* (Baluchistan) said that before commencing the discussion of the question of the financial aspects of museums, he would suggest that each representative state briefly the financial conditions under which his own particular museum was run, *i.e.*, whether maintained wholly by Government or by a Native State or whether a private or Municipal concern and if so whether aided by Government. He thought it would also assist the deliberation of the conference if the delegates give some idea of the grants received and the cost and nature of establishments maintained therefrom. Once in possession of such data they would be in a better position to discuss the financial aspects of museums. To begin with the institution represented by himself, the Quetta Museum was purely a Government concern. An excellent building with good furniture had been provided and Government allowed an annual grant which this year (1907-1908) amounted to Rs. 300 for furniture, Rs. 820 for contingencies. Government allowed also for an establishment consisting of a bearer on Rs. 15 per month, a Chowkidar on Rs. 12 and a Sweeper on Rs. 10, the last two being intended also for the library, which received a grant-in-aid from the Government, being otherwise supported by public subscriptions, etc. The work of the Museum was carried on by Mr. Cumming as Honorary Secretary and Curator and he was assisted by a native clerk from one of the Government offices, who received for his trouble a small allowance of Rs. 15 per month. Neither of them could spare more than 2 hours a day on an average and this time was mostly taken up with the correspondence and other office work of the museum and of the Baluchistan Natural History Society which proved of much assistance to the museum. The result was that progress as regards classification and arrangement of exhibits must naturally be very slow. He might add that the Quetta Museum employed in the post of bearer a taxidermist trained in the Indian Museum, thanks to the liberality of the Hon'ble Sir Henry McMahon who allowed the man so employed another Rs. 15 per month from his own pocket, thus making his pay Rs. 30 in all. The Museum had a committee of management in charge of the museum consisting of the Political Agent,

Quetta, as President, and 5 members with Mr. Cumming as Honorary Secretary, and so far things had worked very smoothly. The Committee sat once a month; its proceedings were regularly recorded and the accounts were audited by one of its members. The arrangement as regards the establishment could not of course continue very much longer on its present lines, if the museum was to become as useful an Institution as the importance of Quetta demanded. Mr. Cumming found the work getting too heavy for him and he hoped it would not be long before Government would be induced to sanction a better establishment, which should he thought consist at least of a permanent Curator, and a more highly paid taxidermist and one peon in addition to the part services of a clerk, sweeper and chowkidar. A larger contingent grant would also be necessary if extensive models or casts and a complete set of works of reference were to be purchased and kept up to date.

II. *Mr. Thurston* (Madras) submitted the following statement as regards the Madras Museum :—

	Rs.	a	p.
Salaries—			
Superintendent (500-50-800)	9,600	0	0
Exchange compensation allowance	600	0	0
Local allowance (200)	2,400	0	0
Establishment—			
First assistant (60-2-80), Herbarium keeper (100-2-120)	2,376	0	0
Clerks (35-2-55), (30-1-40), (15-½-20) and Taxidermists (30-½-35), (20-½-25)	2,052	0	0
Servants 1 (15), 2 (12), 1 (11), 2 (10), 4 (9), 8 (8), 9 (7), 6 (8-¼-10), 1 (7½), 1 (6), 3 (5), 1 (4½), 3 (4)	3,954	0	0
Connemara Public Library—Establishment—			
Sub-Librarian (100-5-150)	1,800	0	0
Attendants (25-½-30), (15-½-20), (12-½-15)	624	0	0
Servants (8), (7), (4)	228	0	0
Allowance—			
Travelling allowance	1,200	0	0
Supplies and Services—			
Cost of specimens purchased on tour	900	0	0
Objects of interest and coin purchased at Head Quarters	700	0	0
Fittings, furniture, etc., for the collection	2,400	0	0
Cost of Books and publications	900	0	0
Library	2,000	0	0
Lithographic plates	500	0	0
Ammunition	15	0	0
Charges for feeding live animals	275	0	0
Expenses—Reading Coin	10	0	0
Contingencies—			
Purchase of furniture	60	0	0
Tour charges	285	0	0
Repairs to furniture	100	0	0
Cleaning charges	65	0	0
Postal charges	280	0	0
Telegram charges	20	0	0
Telephone charges	200	0	0
Rents, rates and taxes	4,473	0	0
Office Expenses	605	0	0
Marine Aquarium—Establishment—			
Head Keeper (18-2-30), Second Keeper (10-1-15)	336	0	0
Servants 2 (9), 2 (8), 1 (7), 1 (5), 1 (3)	586	0	0
Supplies and services—			
Food for animals	500	0	0
Contingencies—			
Lump provision	650	0	0
Add for rounding	4	0	0
GRAND TOTAL	40,700	0	0

III. *Mr. Brown* (Punjab) submitted a statement showing the annual expenditure of the Lahore Museum. He said also that special grants were occasionally sanctioned, but the sum expended on the Museum during a

normal year was that indicated in the statement. With regard to the control, etc., of the Lahore Museum it might be mentioned that it was financed by the Local Government aided by a contribution of Rs. 15 per mensem from the Lahore Municipality. It was controlled by a Committee of representative gentlemen belonging to the province, the Secretary of which is the Curator. A Committee meeting was held annually to read the report, pass the financial statement and to submit to the Local Government any proposals which might be approved. This method of conducting the business part of the Museum worked more satisfactorily. The building was open free to visitors all the year round except on the first Monday of each month, when it was reserved for ladies only. The number of visitors who passed through the turnstile during 1906-07 was 314,548. On the days devoted to the "purdah nashin" 4,420 women were admitted. On these occasions the Museum was strictly "purdah," all the men attendants being withdrawn and their places taken by a lady superintendent with a staff of female assistants.

LAHORE MUSEUM.

Statement of Annual Expenditure.

Particulars.	Amount.	Total.
Establishment—		
	Rs. a. p.	
1 Curator	1,200 0 0	
		1,200 0 0
1 Darogha	935 0 0	
1 Clerk	488 0 0	
1 Librarian	81 14 11	
1 Carpenter	325 0 0	
1 Label Writer	222 8 0	
1 Daftri	106 0 0	
1 Head Farash	96 0 0	
1 Chaprassee	84 0 0	
6 Farashes	429 11 4	
2 Chowkidars	168 0 0	
1 Mali	106 0 0	
1 Assistant Mali	77 0 0	
1 Bhisti	65 0 0	
2 Sweepers	93 0 0	
1 Lady Superintendent	48 0 0	
5 Female Attendants	52 0 0	
		3,377 2 3
Contingencies—		
Purchases	2,593 10 0	
Books and Journals	316 7 7	
Furniture	15 4 0	
Gardening	20 11 6	
Service Labels	93 4 0	
Stationery	78 3 0	
Photographs	58 11 0	
Railway freight	326 2 0	
Telegrams	7 15 0	
Sawdust	30 0 0	
Advertising	11 12 0	
Miscellaneous—nails, hinges, naphthaline, camphor, spirit, coolies, turpentine, kerosine, dusters, glue, paints, etc.	436 5 10	
		3,988 5 11
		8,565 8 2

IV. *Sardar Sahib Bhai Ram Singh* (Punjab) was of the opinion that provincial museums should be managed by a committee of respectable gentlemen of their provinces and the curator, who would be the Secretary. The general report and the financial statement should be placed by the Secretary before the Committee for audit and submission to the Local Government. For the financial aid of the Museum, Municipalities of the provinces should share expenses with the Local Governments as far as possible.

V. *Mr. Ganguli* (United Provinces) submitted the following statement as regards the Lucknow Museum :—

The Provincial Museum at Lucknow is maintained by annual grants from Provincial Revenues. Small contributions to its funds are received from some municipalities in the province but the amount of these do not exceed Rs. 150 in all and are paid into the Treasury to the credit of the Government. The annual expenditure is budgetted for by the Committee of Management and the Budget Estimates are passed by the Local Government. From the year 1885-86, which was the first year of its existence as a Provincial institution, to 1890-91, the annual grant ranged from Rs. 18,000 to Rs. 12,000. Its gradual reduction to the latter amount was due to the fact that when show cases and other fittings which the Museum required in the beginning had been supplied, the institution required a smaller grant for its maintenance. During the past five years the normal grant has fluctuated between Rs. 10,245 to Rs. 10,804. Special grants to meet emergencies, *e.g.*, cost of large collections of coins or other exhibits, are liberally made by the Local Government on application from the Committee. In 1903-04, a sum of Rs. 744 from Imperial sources was allotted by the Director General of Archæology for purchase of antiquities for the Provincial Museum. The expenditure for the past five years is shown below under the chief budget heads :—

Heads of expenditure.	1902-03.	1903-04.	1904-05.	1905-06.	1906-07.
	Rs.	Rs.	Rs.	Rs.	Rs
Establishment.					
Curator	3,165	3,000	3,000	3,636	3,600
Establishment, : 3 clerks, 1 Botanical Collector, 1 Taxidermist, 1 Carpenter, 1 Daftri and 19 servants	2,573	2,521	2,592	2,824	2,959
Travelling allowances . . .	..	..	..	402	261
Contingencies.					
Acquisition and preservation of specimens	1,502	1,492 *4,500*	1,639 *4,400*	1,586	1,549
Library	1,000	996	999	547	998
New cases and furniture . .	300	500	500 *3,000*	500	499
Miscellaneous ; clothing for servants, hot weather charges, water rate on buildings, etc. . .	968	1,041	975	1,079	995
	9,508	14,050	17,105	10,574	10,861

Note.—The figures in italics represent expenditure from special grants.

The present allotment of Rs. 11,000 is just sufficient to maintain the museum as it is now composed and organised. If it be intended to extend its scope by including a zoological section on a large scale, additional funds would be required not only to maintain a qualified staff of taxidermists and collectors but also to provide for improved show cases for an adequate display of the exhibits in the zoological collection.

VI. *Dr. Annandale* said that the Indian Museum was entirely a Government institution. The Natural History Section, of which he was in charge, included the zoological and archæological collections; but the Superintendent of this section had also, in rather an indefinite manner, control of the buildings of the whole institution. The Museum was under a Board of Trustees, members of which were appointed by the Government of India, the Government of Bengal, the Asiatic Society of Bengal and by the Board itself. So far as the Natural History Section was concerned, the Imperial Government gave an annual grant of Rs. 36,000. In addition to this there were certain small sources of income, such as the sale of publications, about Rs. 1,500 a year. The Government grant was supposed to cover all expenses except the salaries of the gazetted staff (which come on an average to Rs. 28,000 a year and were also paid by Government) and necessary repairs to the buildings, which were undertaken by the Public Works Department. Of the Government grant of Rs. 36,000, Rs. 20,044 was paid in salaries to subordinate officers and servants, who were appointed by the Trustees with the consent of the Government of India. Until the present year no budget had been drawn up but each item above Rs. 50 was considered by the Trustees. This arrangement had not proved satisfactory, however, as it was impossible for the Superintendent to procure stores, purchase specimens or make arrangements about the publication of scientific papers without undergoing a somewhat cumbersome procedure. Before the beginning of the financial year 1907-08, therefore, a proposal to submit an annual budget and to grant the Superintendent increased powers as regards expenditure was drawn up by a sub-committee and accepted by the Trustees. A copy of the proposals in detail was submitted, but he would point out that both the library grant (Rs. 4,000) and the grant for expenses of publications (Rs. 4,000) had already proved inadequate and had been supplemented by special grants. The money for these special grants came from a reserve fund consisting mainly of the salaries of posts on the staff temporarily vacant, which the Trustees were permitted by Government to retain.

INDIAN MUSEUM, NATURAL HISTORY SECTION.

Allotment of Funds, 1907-1908.

	Rs.
Library (no work to cost more than Rs. 200 without special sanction)	4,000
Publications (no memoir to cost more than Rs. 500 without special sanction)	4,000
Stationery and Postage (without special sanction)	750
Transport of Specimens to consulting specialists (without special sanction)	300
Alcohol and drugs (without special sanction)	750
Scientific apparatus and glasses (no item to exceed Rs. 400 without special sanction)	3,000
Taxidermists' and carpenters' supplies (without special sanction)	1,000
Travelling allowance and collecting expenses of gazetted staff (without special sanction)	600
Travelling allowance and collecting expenses of subordinate staff and purchase of specimens (no item to exceed Rs. 200 without special sanction)	3,400

Expenditure on exhibition cases and the like was to be treated as extraordinary expenditure and was to come either from the reserve fund or to form the subject of a special application to Government.

VII. *Mr. I. H. Burkill* laid on the table the abstract statement of the financial position of the Industrial Section of the Indian Museum to be found in his report for the year 1905-06, pages 4 to 8.

The following resolution was passed unanimously:—

That each member of the Conference be asked to send to the Secretary for distribution and consideration an abstract statement* of the financial position, needs, prospects of the Museum he represents, and sources of the funds on which the Museum depends.

* The abstract statements which have been submitted are included in the present report.

Twelfth subject—moved by MR. G. D. GANGULI,

"The question of separating the botanical collection from the Lucknow Provincial Museum, etc."

I. This question was introduced by *Mr. Ganguli* (United Provinces), who said that he had been directed by the committee of management of the Lucknow Provincial Museum to ask the opinion of the Conference as to the disposal of the specimens in question. He explained how the collection had come to be in the Museum, gave details as to its condition, etc., and stated that a proposal had been made to hand it over to the Horticultural Gardens, Lucknow. He also gave particulars as regards the collection of economic products in the Lucknow Museum and asked for advice as regards them.

II. *Mr. Holland* thought it was within the province of the Conference to give advice on the point raised by Mr. Ganguli, as the Committee of Management of the Lucknow Museum asked for an opinion on the question. He stated that he had visited the Lucknow Museum himself at the request of His Honour Sir John Hewett, and had given a report containing advice as to the reorganization of the Museum. It was his opinion that the Lucknow Museum should concentrate on archæology and numismatics—the two questions in which it had already established a first class position—that its botanical collections might be conveniently split off and handed over to the care of the officer in charge of the horticultural gardens, while it would be for the good of the public as well as for the benefit of zoology to remove the collections of stuffed animals, and to establish for them a separate museum in connection with zoological gardens in some convenient part of the city. The industrial collections might possibly be handed over to an industrial school, and the economic products might be made use of by the Provincial Agricultural Department. Thus, the suggestions made were in line with the principles governing the reorganisation of the Calcutta Museum, that is to say, the materials available in Lucknow should be divided into natural groups; and seeing it was not possible to keep these together in one institution, it would be better to develop along the lines suggested. The Chairman understood that it was the intention of Sir John Hewett to organize zoological gardens at Lucknow, and in them to establish a zoological museum as soon as the Provincial funds would permit of the additional expenditure involved. He was also in favour of recommending the Museum to hand over their botanical specimens to the horticultural gardens already established in Lucknow.

III. *Mr. Burkill* remarked that he was aware how little space for economic collections was available in the Lucknow Museum, and that he would like again to see the collections before making a recommendation upon the alternatives of housing them elsewhere or doing away with them.

In regard to this subject the following resolution was proposed and passed unanimously:—

> That the Conference approve the proposal of the Committee of the Lucknow Museum to dismantle the collection of botanical specimens at present exhibited in that museum, but recommend that the specimens should not be destroyed, dispersed or sent elsewhere until the Reporter on Economic Products, who will be able to visit Lucknow in a few months, has had an opportunity of inspecting and reporting upon them.

Thirteenth subject—moved by DR. A. MITRA,

"The question of an annual museum conference."

I. *Dr. Mitra* (Kashmir) in opening the discussion, congratulated himself and his fellow delegates on the success of their labours, which had been of the greatest benefit to the curators of provincial museums present at the meeting. The Conference had discussed and had come to practical conclusions on most important questions of administration and other points connected therewith. He wished to make special mention of the scientific spirit with which the Chairman had presided, of the practical instruction received from the Superintendents of the Indian Museum, of the assistance

given by Mr. Thurston, and also of the important results arrived at by the sub-committee on art publications. Altogether the Conference had more than fully justified its existence and would be of immense good to the institutions represented by the various delegates, who now felt that each of them was a member of a conference of museums of the Indian Empire. They would now have a uniformity in their plan of work, and he was of the opinion that they could not have a better guide than the authorities of the "Central Imperial Museum" as he insisted on calling it in spite of objections that had been made to the word "Imperial." They had been brought into closer touch with one another and this could not but be profitable to all concerned.

As to future Conferences. It would be good if there could be an annual conference, but to this the Accountant General might object unless the Governments sanctioned additional grants for travelling allowances in the budget, and the Accountant General's objection would have great weight. Besides, the delegates had swallowed a great deal and must have time for digestion: it would take some time to make practical use of the information gained. He suggested, therefore, that the Conference should be triennial. During the intervening years the representatives of the different museums could of course consult one another and he would recommend that all local museums should vow, unofficially it might be, allegiance to the authorities of the Indian Museum. It would be useful if the Conference met at different centres. He would also suggest that if a standing committee were formed as an advisory body on all matters of museums in India, the work of the present Conference would be usefully kept up.

II. *Dr. Annandale* expressed hearty agreement with Dr. Mitra as regards the proposals that a triennial Conference should be summoned to meet at various centres and that a permanent standing committee should be formed. He felt very grateful for the sentiments expressed as regards the Indian Museum and believed that the present Conference would mark a new era as regards the relations between the Museums of India. Without losing their independence in the slightest, he believed that they would be able to enjoy a closer union both among themselves and with the Indian Museum. In one respect, however, it was perhaps the case that the present conference had not been quite so representative as it might have been, namely, in the fact that the Imperial Agricultural Department, the Archæological Survey and the Bombay Natural History Society had not been officially represented. The Agricultural Department were getting together a very important entomological museum at Pusa; the Archæological Survey would, if the scheme for the reorganization of the Indian Museum which the Chairman had explained were carried into effect, have control of the central archæological collection; while the Bombay Natural History Society possessed, with the exception of the Indian and Madras Museums, by far the most important natural history collections in the country. If a triennial conference was to be held, he would recommend that these departments and this Society should be asked to send delegates to the next meeting. Possibly also delegates might be invited from Ceylon and other neighbouring countries. It would not be necessary to embody his suggestions in a formal resolution, as the standing committee, if it were formed and recognized by Government, could represent such matters to Government, if it were thought advisable.

III. *Mr. Brown* (Punjab) thought that a Conference each year would not be advisable, as it is quite possible that the resolutions brought forward from time to time would require a longer period than twelve months to have any appreciable effect on the policy of Museums generally. He agreed with Dr. Mitra that a Conference every third year would be more suitable and that these should be held at each Museum centre in rotation. In this connection he thought it desirable that delegates should be invited from other quarters than those represented at this Conference, and that particularly the Archæological Department should depute an officer to indicate that department's interests in Museum work.

IV. *Sardar Sahib Bhai Ram Singh* (Punjab) was of the opinion that a general meeting of the delegates should be held annually, generally in Calcutta and sometimes in other stations wherever the Conference might appoint from time to time.

The following resolutions were passed unanimously :—

1. That a Conference be held triennially.
2. That a standing committee be appointed to make arrangements regarding future Conferences and to advise on Museum matters.
3. That the standing committee take steps to ensure that bodies interested in Museum matters shall be represented at future Conferences.
4. That the standing committee consist of five members.
5. That the standing committee consist of Messrs. T. H. Holland, E. Thurston, Percy Brown, and of the Superintendents of the Natural History and Industrial Sections of the Indian Museum, and that they shall have the power to fill vacancies that may occur in the membership of the committee.

THE RESOLUTIONS PASSED BY THE CONFERENCE.

The resolutions passed by the Conference have already been given under the headings of the various debates from which each arose; but it may be convenient to print them again together, giving to each a number, which may be used as a reference in any future correspondence. The Conference had no power to pledge the Governments or Institutions represented by the delegates to the expenditure of money or to the official sanction of its proposals. The majority of its resolutions, therefore, although some deal with matters which can be arranged directly by the heads of the local and central museums, must be regarded as advice given to the Imperial and Local Governments of India by the Conference.

It may be as well to state the method in which the resolutions were drawn up and discussed. In the first place, at the end of each debate, the subjects to be embodied in the resolutions arising therefrom and the opinions of the delegates to be expressed were discussed informally and a sub-committee was appointed to draft the resolution for each day's debates. This sub-committee consisted, so far as the first day's debates were concerned, of the following delegates :—Messrs. Annandale, Burns, and Cameron; while Messrs. Annandale and Thurston were appointed to deal in the same way with the debates of the other two days during which the Conference sat. The drafted resolutions were then submitted at a special meeting held at the end of the Conference and their wording was carefully considered. In cases in which there was any difference of opinion an informal discussion took place, and even in those in which the opinions of the delegates were unanimous, changes in the wording of the resolution were frequently suggested and discussed.

The resolutions the first word of which is marked with an asterisk were passed unanimously, the others by a majority.

I. *That the systematic exchange of duplicates and of reproduction of unique specimens between the Indian Museum and the Provincial† Museums would be beneficial to both from a scientific and an economic point of view.

II. *That in order to ascertain the wants of the different Museums as regards duplicates and reproductions, the Superintendent of the Indian Museum should have opportunities of consulting with the officers of the Provincial† Museums from time to time.

III. *That lists of duplicate specimens available for distribution in the various Museums should be circulated.

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† The word "Provincial" is understood to include Presidency and State Museums.

IV. *That, in order that these proposals should be carried out, it is necessary that there should be a considerable increase in the expert staff of the central museum at Calcutta and in the skilled subordinate staff both of the Indian and of Provincial Museums.

V. *That as the qualities and training necessary for subordinates who have the sorting, cataloguing and distribution of specimens cannot be gauged by the ordinary standard of examination, Directors of Public Instruction in India should be informed of the qualifications necessary for the work and of the prospects of the boys fitted to undertake it, and that selected candidates for the posts in the Provincial Museums should undergo a period of training in the Indian Museum.

VI. *That taxidermists for the Provincial Museums should be trained in the Indian Museum, and that an expert taxidermist should be employed from Europe or America and attached to the staff of the Indian Museum, in order that he might both do the work of that institution and supervise the training of the provincial men.

VII. *That in order to assist the Indian Museum in its survey of the fauna of India, local museums shall give what assistance they can, and that the Superintendent of the Natural History Section shall be asked to draw up and circulate a statement of the special requirements of the Museum.

VIII. *That in order to interest recognized authorities on Natural History, Archæology and other subjects in the different provinces they shall be given a definite position on the staff of the Museums by their apointment as honorary officers.

IX. *That the "Records" and "Memoirs" of the Geological Survey shall be the recognized official medium for the publication of scientific geological work in India, the "Records" and "Memoirs" of the Indian Museum for that of zoology and the publications of the Botanical Survey for that of botanical work, the "Records" in each case being devoted to shorter papers and notes, and the "Memoirs" to more detailed monographs.

X. *That in every case the size of the "Records" shall be super royal octavo ($11\frac{1}{2}'' \times 7''$).

XI. *That in the "Records" each paper shall commence on a separate page.

XII. *The Conference consider it desirable that the publications on Art—Pure and Industrial—made in India should be unified. The publication should take the form of a serial edited and conducted in a way similar to the Memoirs of the Geological Survey, Zoological, Botanical and Archæological departments.

XIII. *That the Provincial monographs on Industrial Arts and the Technical Art series published by the Survey of India should be absorbed. From the serial extra plates might be easily struck off for the use of Schools of Art and for other purposes.

XIV. *The Conference believe that the present system, by which the Provincial Governments are asked to write monographs on specified subjects, cannot much longer continue, because the subjects common to most of the provinces have now been exhausted, and further the Conference believe that the Technical Art series find a far more extensive sale among European visitors to India

than among the class for whom it was intended. The class to which these visitors belong would be more easily reached by a serial than they are by the present publication, while the artisans should be reached by pattern books through the Schools of Art. The serial would form the basis from which the designs of the pattern books should be taken.

XV. *That all zoological types in India shall be deposited in the Indian Museum, but that the Superintendent of the Natural History Section shall be empowered, with the consent of the Trustees, to transfer to the British Museum (Natural History) such entomological "types" as may be, in his opinion, in danger of destruction owing to the climate.

XVI. *That all Palæontological "types" shall be placed in charge of the Director of the Geological Survey, and all Botanical "types" in that of the Director of the Botanical Survey.

XVII. *That in each case either a duplicate, a drawing or photograph of the type shall be sent to the institution from which the original specimen was obtained, and that the "type" itself may be lent for scientific examination to this or other institutions if it can be sent with safety.

XVIII. *That it would be useful that lists of types should be published periodically.

XIX. *That all specimens received at any Museum shall be entered in a general register as expeditiously as possible and that the register shall be divided into volumes representing the main sections of the collection in such a way that the ordinary clerk can appreciate the difference between these sections at sight and with no possibility of confusion. The following eight headings were approved as being suitable for the collections of a Provincial Museum :—

1. Archæology and Epigraphy.
2. Coins and Medals.
3. Art and Ethnology.
4. Economic Products.
5. Geology.
6. Plants.
7. Animals.
8. Books, Maps and Manuscripts.

XX. *That the Conference expressed their approval of the scheme for splitting the Indian Museum into sections as proposed by the Trustees and were of the opinion that the principles involved were the best so far as the central museum for India was concerned.

XXI. *Dr. Annandale and Mr. Burkill were requested to incorporate their remarks on the subject of the preservation of specimens in a note and to circulate them to the different museums. They were also requested to conduct systematic experiments on the effect of naphthaline in preserving specimens of different kinds from the attack of insects.

XXII. That the provincial museums of India should in the main confine their scope to the presidency, province or state in which they are situated.

XXIII. That in the opinion of the Conference, it is desirable that in every province or state there should be but one Government or State public museum.

XXIV. *That the officers of every provincial museum should have direct access to a good reference library, and that this library should whenever possible be connected with the museum.

XXV. That the preparation of guides and catalogues is eminently desirable provided that such works can be prepared by the officer in charge or by some competent authority. That the issue of guides in the vernacular languages is quite unnecessary.

XXVI. *That each member of the Conference be asked to send to the Secretary for distribution and consideration an abstract statement of the financial position, needs, prospects of the Museum he represents, and sources of the funds on which the Museum depends.

XXVII. *That the Conference approve the proposal of the Committee of the Lucknow Museum to dismantle the collection of Botanical specimens at present exhibited in that Museum, but recommend that the specimens should not be destroyed, dispersed or sent elsewhere until the Reporter on Economic Products, who will be able to visit Lucknow in a few months, has had an opportunity of inspecting and reporting upon them.

XXVIII. *That a Conference be held triennially.

XXIX. *That a standing committee be appointed to make arrangements regarding future Conferences and to advise on Museum matters.

XXX. *That the standing committee take steps to ensure that bodies interested in Museum matters shall be represented at future Conferences.

XXXI. *That the standing committee consist of five members.

XXXII. *That the standing committee consist of Messrs. T. H. Holland, E. Thurston, Percy Brown and of the Superintendents of the Natural History and Industrial Sections of the Indian Museum, and that they shall have the power to fill vacancies that may occur in the membership of the committee.

CALCUTTA: PRINTED BY SUPDT. GOVT. PRINTING, INDIA, 8, HASTINGS STREET.

REPORT

ON

COINS DEALT WITH UNDER THE TREASURE TROVE ACT

IN THE CENTRAL PROVINCES AND BERAR

DURING THE YEAR

1917-18.

Agents for the Sale of Books published by the Central Provinces Administration.

IN ENGLAND.

CONSTABLE & CO., 10, Orange Street, Leicester Square, London, W. C.
P. S. KING & SON, 9, Bridge Street, Westminster, London, S. W.
KEGAN, PAUL, TRENCH, TRÜBNER & CO., 68/74, Carter Lane, London, E. C., and 25, Museum Street, London, W. C.
B. QUARITCH, 11, Grafton Street, New Bond Street, London, W.
GRINDLAY & CO., 54, Parliament Street, London, S. W.
DEIGHTON BELL & CO., LTD., Cambridge.
B. H. BLACKWELL, 50 & 51, Broad Street, Oxford.
HENRY S. KING & CO., 65, Cornhill, London, E. C.
LUZAC & CO., 46, Great Russell Street, London, W. C.
W. THACKER & CO., 2, Creed Lane, London, E. C.
OLIVER & BOYD, Tweeddale Court, Edinburgh.
E. PONSONBY, LTD., 116, Grafton Street, Dublin.
T. FISHER UNWIN, LTD., 1, Adelphi Terrace, London, W.C.
WILLIAM WESLEY & SON, 28, Essex Street, Strand, London.

ON THE CONTINENT.

ERNEST LEROUX, 28, Rue Bonaparte, Paris.
MARTINUS NIJHOFF, The Hague.

IN INDIA AND THE COLONIES.

THACKER, SPINK & CO., Calcutta and Simla.
NEWMAN & CO., Calcutta.
R. CAMBRAY & CO., Calcutta.
S. K. LAHIRI & CO., Calcutta.
BUTTERWORTH & CO. (INDIA), LTD., 8-2, Hastings Street, Calcutta.
CALCUTTA SCHOOL BOOK & USEFUL LITERATURE SOCIETY, Calcutta.
THE WELDON LIBRARY, 18-5, Chowringhee Road, Calcutta.
M. C. SIRCAR & SONS, 75, Harrison Road, Calcutta.
A. J. COMBRIDGE & CO., Bombay.
THACKER & CO., LTD., Bombay.
D. B. TARAPOREVALA, SONS & CO., Bombay.
RADHABAI ATMARAM SAGOON, Bombay.
SUNDER PANDURANG, 25, Kalbadevi Road, Bombay.
RAMCHANDRA GOVIND & SON, Booksellers, Kalbadevi, Bombay.
A. J. COMBRIDGE & CO., Madras.
HIGGINBOTHAM & CO., Madras.
V. KALYANARAM IYER & CO., Madras.
G. A. NATESAN & CO., Madras.
S. MURTHY & CO., Madras.
THOMPSON & CO., Madras.
TEMPLE & CO., Madras.
RAI SAHIB M. GULAB SINGH & SONS, Lahore.
THE PROPRIETOR, NEWAL KISHORE PRESS, Lucknow.
N. B. MATHUR, SUPERINTENDENT, NAZAIR KANUN HIND PRESS, Allahabad.
A. H. WHEELER & CO., Allahabad, Calcutta and Bombay.
SUPERINTENDENT, AMERICAN BAPTIST MISSION PRESS, Rangoon.
MANAGER, GENERAL BOOK DEPÔT, Nagpur and Jubbulpore.
THE MANAGER, "THE HITAWAD," Nagpur.
BABU S. C. TALUQDAR, Proprietor, Students & Co., Cooch Behar.
A. M. & J. FERGUSON, Booksellers, Ceylon.

No. 2197.

FROM

D. CLOUSTON, Esq., M.A., B.Sc.,

OFFG. DIRECTOR OF AGRICULTURE,

Central Provinces and Berar.

To

THE SECRETARY TO THE HON'BLE THE CHIEF COMMISSIONER,

MISCELLANEOUS DEPARTMENT,

Central Provinces.

Nagpur, the 28th June 1918.

SIR,

I have the honour to submit the annual report on coins dealt with during the financial year 1917-18 under the Treasure Trove Act as required by Chief Commissioner's Book Circular No. IV-9. The prescribed Statements A and B, showing details of Forms III and IV, are appended.

2. On the recommendation of the Asiatic Society of Bengal 192 Silver Coins and one Copper Coin were acquired during the year under report. Chanda contributed 39, Damoh 62, Mandla 6, Hoshangabad 13, Raipur 5, and Bilaspur 67 Silver. Coins and Drug 1 Copper Coin. The coins found in the Damoh, Mandla, Hoshangabad, Raipur and Drug were distributed in the year under report. Those of the Chanda and Bilaspur districts were received in this office after 31st March 1918 and their distribution will be shown in the Report for 1918-19.

3. All those acquired were Moghul Coins

I have the honour to be,

Sir,

Your most obedient Servant,

D. CLOUSTON,

Offg. Director of Agriculture,

Central Provinces and Berar.

STATEMENTS.

Classification, by metal and by the series to which they belong, of coins found in the various districts
Revised Book Circular No. IV-9

Districts wherein found.	Gold.													
	Ancient.	Mediæval.	Pathan.	Suri.	Moghul.	Oudh.	East India Company.	Illegible.	Undeciphered.	Total.	Ancient.	Mediæval.	Pathan.	Suri.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Nagpur														
Balaghat														
Wardha														
Chanda														
Bhandara														
Jubbulpore														
Saugor														
Damoh														
Seoni														
Mandla														
Hoshangabad														
Nimar														
Narsinghpur														
Betul														
Chhindwara														
Raipur														
Bilaspur														
Drug														
Amraoti														
Akola														
Buldana														
Yeotmal														
Total														

MENT A.

of the Central Provinces and Berar, and dealt with under the rules contained in Chief Commissioner's during the year 1917-18.

Silver.						Copper.										
Moghul.	Oudh.	East India Company.	Illegible.	Undeciphered.	Total.	Ancient.	Mediæval.	Pathan.	Suri.	Moghul.	Oudh.	East India Company.	Illegible.	Undeciphered.	Total.	Grand Total.
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	39	...	...	...	...	...	...	...	...	...	...	39
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
62	...	...	...	...	62	...	...	...	...	...	...	...	...	...	...	62
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	6	...	...	...	...	...	...	...	...	...	...	6
13	...	...	...	...	13	...	...	...	...	...	...	...	...	...	...	13
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	5	...	...	...	...	...	...	...	...	...	...	5
67	...	...	...	...	67	...	...	...	...	...	...	...	...	...	...	67
...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	1	1
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
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...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
192	...	...	...	...	192	...	...	...	...	1	...	...	...	...	1	193

Classification by metal of coins found in the several districts of the Central Provinces and Berar during the

Districts.	Gold.																			
	Nagpur Museum.	Indian Museum.	Madras Museum.	Provincial Museum, Lucknow.	Lahore Museum.	Public Library, Shillong.	Poona Museum.	Peshawar Museum.	Quetta Museum.	Ajmere Museum.	Rangoon Museum.	Asiatic Society of Bengal.	Bombay Branch, Royal Asiatic Society.	British Museum.	Calcutta Mint.	Dacca Museum.	Bihar and Orissa Coin Cabinet, Bankipur.	Decipherer.	For sale at Nagpur.	Total.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Nagpur																				
Balaghat																				
Wardha																				
Chanda																				
Bhandara																				
Jubbulpore																				
Saugor																				
Damoh																				
Seoni																				
Mandla																				
Hoshangabad																				
Nimar																				
Narsinghpur																				
Betul																				
Chhindwara																				
Raipur																				
Bilaspur																				
Drug																				
Amraoti																				
Akola																				
Buldana																				
Yeotmal																				
Total																				

and distributed to the various institutions and others as recommended by the Asiatic Society of Bengal year 1917-18.

Silver.

Nagpur Museum.	Indian Museum.	Delhi Museum.	Madras Museum.	Provincial Museum, Lucknow.	Lahore Museum.	Public Library, Shillong.	Poona Museum.	Peshawar Museum.	Quetta Museum.	Ajmere Museum.	Rangoon Museum.	Asiatic Society of Bengal.	Bombay Branch, Royal Asiatic Society.	British Museum.	Calcutta Mint.	Dacca Museum.	Fitz-William Museum, Cambridge.	Decipherer.	For sale at Nagpur.	Total.
22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
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...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
52	...	6	...	3	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	62
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	6
12	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	13
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
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4	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	5
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
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72	...	8	...	3	1	2	...	...	...	...	...	...	...	...	...	...	...	...	...	86

STATEMENT B.—(*Concld.*)

Classification by metal of coins found in the several districts of the Central Provinces and Berar and distributed to the various institutions and others as recommended by the Asiatic Society of Bengal during the year 1917-18.

Districts.	Copper.																		
	Nagpur Museum.	Indian Museum.	Madras Museum.	Provincial Museum, Lucknow.	Lahore Museum.	Public Library, Shillong.	Poona Museum.	Peshawar Museum	Quetta Museum.	Ajmere Museum.	Rangoon Museum.	Asiatic Society of Bengal.	Bombay Branch, Royal Asiatic Society.	British Museum.	Calcutta Mint.	Dacca Museum.	Decipherer.	For sale at Nagpur.	Total.	Grand Total.
1	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62
Nagpur							6													
Balaghat																				
Wardha																				
Chanda																				
Bhandara																				
Jubbulpore																				
Saugor																				
Damoh																				62
Seoni																				
Mandla																				6
Hoshangabad																				13
Nimar																				
Narsinghpur																				
Betul																				
Chhindwara																				
Raipur																				5
Bilaspur																				
Drug		1																	1	1
Amraoti																				
Akola																				
Buldana																				
Yeotmal																				
Total		1																	1	87

FORM III.—Chief Commissioner's Book Circular No. IV-9.

Classification, by metal and by the series to which they belong, of coins found in the districts of the Central Provinces and Berar and acquired for distribution to various coin cabinets, etc., during the year 1917-18.

Metal.	Ancient.	Mediæval.	Pathan.	Suri.	Moghul.	Oudh.	East India Company.	As yet undeciphered.	Total.
1	2	3	4	5	6	7	8	9	10
Gold	...	...	...	...	...	...	...	...	...
Silver	...	...	...	...	192	...	...	...	192
Copper	...	...	...	...	1	...	...	...	1
Total ...	...	...	...	...	193	...	...	...	193

FORM IV.—Chief Commissioner's Book Circular No. IV-9.

Distribution of coins found in the districts of the Central Provinces and Berar as recommended by the Asiatic Society of Bengal during the year 1917-18.

Names.	Gold.	Silver.	Copper.	Total.
1	2	3	4	5
Nagpur Museum	...	72	1	73
Indian Museum	...	...	...	...
Delhi Museum	...	8	...	8
Madras Museum	...	...	...	...
Provincial Museum, Lucknow	...	3	...	3
Lahore Museum	...	1	...	1
Public Library, Shillong	...	2	...	2
Poona Museum	...	...	...	...
Peshawar Museum	...	...	...	...
Quetta Museum	...	...	...	...
Ajmere Museum	...	...	...	...
Rangoon Museum	...	...	...	...
Asiatic Society, Bengal	...	...	...	...
Bombay Branch, Royal Asiatic Society	...	...	...	...
British Museum, London	...	...	...	...
Calcutta Mint	...	...	...	...
Dacca Museum	...	...	...	...
Fitz-William Museum, Cambridge	...	...	...	...
Decipherer	...	...	...	...
For sale at Nagpur	...	...	...	...
Total	...	86	1	87

Govt. Press, Nagpur.—No. 719, Dir. of Agri.—21-9-18.—150.

REPORT

ON

COINS DEALT WITH UNDER THE TREASURE TROVE ACT

IN THE CENTRAL PROVINCES AND BERAR

DURING THE YEAR

1918-19

Agents for the Sale of Books published by the Central Provinces Administration.

IN ENGLAND.

CONSTABLE & CO., 10, Orange Street, Leicester Square, London, W. C.
P. S. KING & SON, 9, Bridge Street, Westminster, London, S. W.
KEGAN, PAUL, TRENCH, TRÜBNER & CO., 68/74, Carter Lane, London, E. C., and 25, Museum Street, London, W. C.
B. QUARITCH, 11, Grafton Street, New Bond Street, London, W.
GRINDLAY & CO., 54, Parliament Street, London, S. W.
DEIGHTON BELL & CO., LTD., Cambridge.
B. H. BLACKWELL, 50 & 51, Broad Street, Oxford.
HENRY S. KING & CO., 65, Cornhill, London, E. C.
LUZAC & CO., 46, Great Russell Street, London, W. C.
W. THACKER & CO., 2, Creed Lane, London, E. C.
OLIVER & BOYD, Tweeddale Court, Edinburgh.
E. PONSONBY, LTD., 116, Grafton Street, Dublin.
T. FISHER UNWIN, LTD., 1, Adelphi Terrace, London, W. C.
WILLIAM WESLEY & SON, 28, Essex Street, Strand, London.

ON THE CONTINENT.

ERNEST LEROUX, 28, Rue Bonaparte, Paris.
MARTINUS NIJHOFF, The Hague.

IN INDIA AND THE COLONIES.

THACKER, SPINK & CO., Calcutta and Simla.
NEWMAN & CO., Calcutta.
R. CAMBRAY & CO., Calcutta.
S. K. LAHIRI & CO., Calcutta.
BUTTERWORTH & CO. (INDIA), LTD., 8-2, Hastings Street, Calcutta.
CALCUTTA SCHOOL BOOK & USEFUL LITERATURE SOCIETY, Calcutta
THE WELDON LIBRARY, 18-5, Chowringhee Road, Calcutta.
M. C. SIRCAR & SONS, 75, Harrison Road, Calcutta.
A. J. COMBRIDGE & CO., Bombay.
THACKER & CO., LTD., Bombay.
D. B. TARAPOREVALA, SONS & CO., Bombay.
RADHABAI ATMARAM SAGOON, Bombay.
RAMNATH SUNDER, 25, Kalbadevi Road, Bombay.
RAMCHANDRA GOVIND & SON, Booksellers, Kalbadevi, Bombay.
A. J. COMBRIDGE & CO., Madras.
HIGGINBOTHAM & CO., Madras.
V. KALYANARAM IYER & CO., Madras.
G. A. NATESAN & CO., Madras.
S. MURTHY & CO., Madras.
THOMPSON & CO., Madras.
TEMPLE & CO., Madras.
RAI SAHIB M. GULAB SINGH & SONS, Lahore.
THE PROPRIETOR, NEWAL KISHORE PRESS, Lucknow.
N. B. MATHUR, SUPERINTENDENT, NAZAIR KANUN HIND PRESS, Allahabad.
A. H. WHEELER & CO., Allahabad, Calcutta and Bombay.
SUPERINTENDENT, AMERICAN BAPTIST MISSION PRESS, Rangoon.
MANAGER, GENERAL BOOK DEPÔT, Nagpur and Jubbulpore.
THE MANAGER, "THE HITAWAD," Nagpur.
BABU S. C. TALUQDAR, Proprietor, Students & Co., Cooch Behar.
A. M. & J. FERGUSON, Booksellers, Ceylon.
THE STANDARD BOOKSTALL, Karachi.

No. 1230.

FROM

H. R. CROSTHWAITE, ESQ., C.I.E.,

DIRECTOR OF INDUSTRIES,

Central Provinces,

TO

THE SECRETARY TO THE HON'BLE THE CHIEF COMMISSIONER,

COMMERCE AND INDUSTRY DEPARTMENT,

Central Provinces.

Dated Nagpur, the 3rd July 1919.

SIR,

I have the honour to submit the annual report on coins dealt with during the year 1918-19 under the Treasure Trove Act, as required by the Chief Commissioner's Book Circular No. IV-9. The prescribed Statements A and B showing details of Forms III and IV are appended.

2. On the recommendation of the Asiatic Society of Bengal, 9 gold coins, 197 silver coins and 62 copper coins were acquired during the year under report. Chanda contributed all the gold coins. Wardha contributed 11, Chanda 39, Jubbulpore 20, Hoshangabad 60 and Bilaspur 67 silver coins; and Chanda 46 and Damoh 16 copper coins. The coins found were all distributed in the year under report, with the exception of the 60 silver coins contributed by the Hoshangabad district. These latter were acquired during the year, but their distribution, which has not yet been effected, will be shown in next year's report.

3. All the coins acquired were Moghul, except the 9 gold coins found in Chanda. This Chanda find is of extraordinary interest and includes 2 gold pieces of Sulaiman of Turkey, minted at Aleppo (A. D. 926), 3 gold pieces of Murad ben Salim of Turkey, minted at Misr in Egypt (A. D. 982), a Persian coin dated 1004, and a coin of doubtful age issued by King Ladislaus of Bohemia under the suzerainty of Rudolph II. When it is remembered that even the ancient Romans regarded India as a country which absorbed gold but never returned it, this find is peculiarly interesting.

I have the honour to be,

Sir,

Your most obedient Servant,

H. R. CROSTHWAITE,

Director of Industries,

Central Provinces.

STATEMENTS.

STATEMENT

Classification, by metal and by the series to which they belong, of coins found in the various districts
Revised Book Circular No. IV-9,

Districts wherein found.	Gold.										Sil			
	Ancient.	Mediæval.	Pathan.	Suri.	Turkish, Persian and Bohemian.	Oudh.	East India Company.	Illegible.	Undeciphered.	Total.	Ancient.	Mediæval.	Pathan.	Suri.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Nagpur														
Balaghat														
Wardha														
Chanda					9					9				
Bhandara														
Jubbulpore														
Saugor														
Damoh														
Seoni														
Mandla														
Hoshangabad														
Nimar														
Narsinghpur														
Betul														
Chhindwara														
Raipur														
Bilaspur														
Drug														
Amraoti														
Akola														
Buldana														
Yeotmal														
Total					9					9				

A.

of the Central Provinces and Berar, and dealt with under the rules contained in Chief Commissioner's during the year 1918-19.

ver.						Copper.										
Moghul.	Oudh.	East India Company.	Illegible.	Undeciphered.	Total.	Ancient.	Mediæval.	Pathan.	Suri.	Moghul.	Oudh.	East India Company.	Illegible.	Undeciphered.	Total.	Grand Total.
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	11	...	...	...	...	...	...	...	...	...	...	11
39	...	...	...	...	39	...	...	...	...	46	...	...	...	...	46	94
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	20	...	...	...	...	...	...	...	...	...	...	20
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	16	...	...	...	...	16	16
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
60	...	...	...	...	60	...	...	...	...	...	...	...	...	...	...	60
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
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...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
67	...	...	...	...	67	...	...	...	...	...	...	...	...	...	...	67
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
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...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
197	...	...	...	...	197	...	...	...	...	62	...	...	...	...	62	268

Classification by metal of coins found in the several districts of the Central Provinces and Berar during the

Districts.	Gold.																			
	Nagpur Museum.	Indian Museum.	Delhi Museum.	Madras Museum.	Provincial Museum, Lucknow.	Lahore Museum.	Public Library, Shillong.	Archæological Museum, Poona.	Peshawar Museum.	Quetta Museum.	Ajmere Museum.	Rangoon Museum.	Dacca Museum.	Bihar and Orissa Coin Cabinet, Bankipore.	Asiatic Society, Bengal.	Bombay Branch, Royal Asiatic Society.	British Museum.	Calcutta Mint.	Decipherer.	For sale at Nagpur.	Total.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Nagpur ...	...	...	-	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Balaghat ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Wardha ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Chanda ...	1	8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	9
Bhandara ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Jubbulpore ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Saugor ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Damoh ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Seoni ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Mandla ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Hoshangabad...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Nimar ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Narsinghpur ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Betul ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Chhindwara ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Raipur ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Bilaspur ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Drug ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Amraoti ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Akola ...	...	..	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Buldana ...	..	...	...	...	...	...	...	...	...	...	...	..	...	...	...	...	...	...	...	...	...
Yeotmal ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	1	8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	9

and distributed to the various institutions and others as recommended by the Asiatic Society of Bengal year 1918-19.

Silver.

Nagpur Museum.	Indian Museum.	Delhi Museum.	Madras Museum.	Provincial Museum, Lucknow.	Lahore Museum.	Public Library, Shillong.	Archæological Museum, Poona.	Peshawar Museum.	Quetta Museum.	Ajmere Museum.	Rangoon Museum.	Dacca Museum.	Bihar and Orissa Coin Cabinet, Bankipore.	Asiatic Society, Bengal.	Bombay Branch, Royal Asiatic Society.	British Museum.	Calcutta Mint.	Decipherer.	For sale at Nagpur.	Total.
23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	..	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	..	...	...	...	11
27	...	8	...	2	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	39
..	...	...	...	...	...	...	..	...	...	...	...	...	...	...	...	...	...	...	...	...
10	1	1	1	1	1	1	...	...	...	...		...	...	...	...	...	...	4	...	20
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
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...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	1	24	...	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	67
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
88	2	33	1	5	3	1	...	...	...	...	...	...	...	...	...	...	...	4	...	137

STATEMENT B.—(*Concld.*)

Classification by metal of coins found in the several districts of the Central Provinces and Berar and distributed to the various institutions and others as recommended by the Asiatic Society of Bengal during the year 1918-19.—(Concld.)

Copper.

Districts.	Nagpur Museum.	Indian Museum.	Delhi Museum.	Madras Museum.	Provincial Museum, Lucknow.	Lahore Museum.	Public Library, Shillong.	Archæological Museum, Poona.	Peshawar Museum.	Quetta Museum.	Ajmere Museum.	Rangoon Museum.	Dacca Museum.	Bihar and Orissa Coin Cabinet, Bankipore.	Asiatic Society, Bengal	Bombay Branch, Royal Asiatic Society.	British Museum.	Calcutta Mint.	Decipherer.	For sale at Nagpur.	FitzWilliam Museum, Cambridge.	Total.	Grand Total.
1	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66
Nagpur	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Balaghat	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Wardha	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	11
Chanda	...	41	1	2	...	..	...	1	1	...	...	...	...	...	...	...	...	...	...	...	...	46	94
Bhandara	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	..	...	...	...	...
Jubbulpore	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	..	...	...	...	...	20
Saugor	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Damoh	...	...	...	7	...	3	1	...	...	...	2	1	...	...	...	1	...	...	...	...	1	16	16
Seoni	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Mandla	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Hoshangabad	..	...	...	...	...	...	...	..	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Nimar	...	...	...	...	...	...	...	...	...	...	...	..	...	...	...	...	...	...	...	...	...	...	...
Narsinghpur	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	..	...	...	...
Betul	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	..	...	...	...	...	...	...
Chhindwara	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Raipur	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Bilaspur	...	...	...	...	..	...	...	...	...	...	...	...	...	...	..	...	...	...	...	...	...	...	67
Drug	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	..	...		...	...	...
Amraoti	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	..	...	...	...	..	...	...	...
Akola	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Buldana	...	...	...	...	...	...	...	...	...	...	...	...	...		...	...	...	...	...	...	...	...	
Yeotmal	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Total	41	1	9	...	3	1	1	1	...	...	2	1	...	...	...	1	...	...	...	...	1	62	208

FORM III.—Chief Commissioner's Book Circular No. IV-9.

Classification, by metal and by the series to which they belong, of coins found in the districts of the Central Provinces and Berar and acquired for distribution to various coin cabinets, etc., during the year 1918-19.

Metal.	Ancient.	Mediæval.	Pathan.	Suri.	Turkish, Persian and Bohemian.	Moghul.	Oudh.	East India Company.	As yet undeciphered.	Total.
1	2	3	4	5	6	7	8	9	10	11
Gold ...	...	...	...	...	9	...	...	...	...	9
Silver ...	...	...	...	...	...	197	...	...	...	197
Copper ...	...	...	...	...	...	62	...	...	...	62
Total ...	...	...	...	...	9	259	...	...	...	268

FORM IV.—CHIEF COMMISSIONER'S BOOK CIRCULAR NO. IV-9.

Distribution of coins found in the districts of the Central Provinces and Berar as recommended by the Asiatic Society of Bengal during the year 1918-19.

Names.	Gold.	Silver.	Copper.	Total.
1	2	3	4	5
Nagpur Museum	1	88	41	130
Indian Museum	8	2	1	11
Delhi Museum		33	9	42
Madras Museum		1		1
Provincial Museum		5	3	8
Lahore Museum		3	1	4
Public Library, Shillong		1	1	2
Archæological Museum, Poona			1	1
Peshawar Museum				
Quetta Museum				
Ajmere Museum			2	2
Rangoon Museum			1	1
Dacca Museum				
Bihar and Orissa Coin Cabinet, Bankipore				
Asiatic Society, Bengal				
Bombay Branch, Royal Asiatic Society			1	1
British Museum				
Calcutta Mint				
Decipherer		4		4
For sale at Nagpur				
FitzWilliam Museum, Cambridge			1	1
Total	9	137	62	208

Govt. Press, Nagpur :—No. 742, Dir. of Industry.—5-7-19—150.

REPORT

ON

COINS DEALT WITH UNDER THE TREASURE TROVE ACT

IN THE CENTRAL PROVINCES AND BERAR

DURING THE YEAR

1919-20

Agents for the sale of Books published by the Central Provinces Administration.

IN ENGLAND.

CONSTABLE & Co., 10, Orange Street, Leicester Square, London, W. C.
P. S. KING & SON, 9, Bridge Street, Westminster, London., S. W.
KEGAN PAUL, TRENCH, TRÜBNER & Co., 68/74, Carter Lane, London, E. C., and 25, Museum Street, London, W. C
B. QUARITCH, 11, Grafton Street, New Bond Street, London, W.
GRINDLAY & Co., 54, Parliament Street, London, S. W.
DEIGHTON BELL & Co., Limited, Cambridge.
B. H. BLACKWELL, 50 & 51, Broad Street, Oxford.
HENRY S. KING & Co., 65, Cornhill, London, E. C.
LUZAC & Co., 46, Great Russell Street, London, W. C.
W. THACKER & Co., 2, Creed Lane, London, E. C.
OLIVER & BOYD, Tweeddale Court, Edinburgh.
E. PONSONBY, Limited, 116, Grafton Street, Dublin.
T. FISHER UNWIN, Limited, Adelphi Terrace, London, W. C.
WILLIAM WESLEY & SON, 28, Essex Street, Strand, London.

ON THE CONTINENT.

ERNEST LEROUX, 28, Rue Bonaparte, Paris.
MARTINUS NIJHOFF, The Hague.

IN INDIA AND THE COLONIES.

THACKER, SPINK & Co., Calcutta and Simla.
NEWMAN & Co., Calcutta.
R. CAMBRAY & Co., Calcutta.
S. K. LAHIRI & Co., Calcutta.
BUTTERWORTH & Co. (India), Limited, 8/2, Hastings Street, Calcutta.
CALCUTTA SCHOOL BOOK AND USEFUL LITERATURE SOCIETY, Calcutta.
THE WELDON LIBRARY, 18/5, Chowringhee Road, Calcutta.
M. C. SIRCAR & SONS, 75, Harrison Road, Calcutta.
A. J. COMBRIDGE & Co., Bombay.
THACKER & Co., LD., Bombay.
D. B. TARAPOREVALA, SONS & Co., Bombay.
RADHABAI ATMARAM SAGOON, Bombay.
SUNDAR PANDURANG, 25, Kalbadevi Road, Bombay.
RAMCHANDRA GOVIND & SON, Booksellers, Kalbadevi, Bombay.
A. J. COMBRIDGE & Co., Madras.
HIGGINBOTHAM & Co., Madras.
V. KALYANARAM IYAR & Co., Madras.
G. A. NATESAN & Co., Madras.
S. MURTHY & Co., Madras.
THOMPSON & Co., Madras.
TEMPLE & Co., Madras.
RAI SAHIB M. GULAB SINGH & SONS, Lahore.
THE PROPRIETOR, NEWAL KISHORE PRESS, Lucknow.
N. B. MATHUR, SUPERINTENDENT, NAZAIR KANUN HIND PRESS, Allahabad.
A. H. WHEELER & Co., Allahabad, Calcutta and Bombay.
SUPERINTENDENT, AMERICAN BAPTIST MISSION PRESS, Rangoon.
MANAGER, GENERAL BOOK DEPÔT, Nagpur and Jubbulpore.
THE MANAGER, THE "HITAWAD," Nagpur.
A. M. & J. FERGUSON, Booksellers, Ceylon.
BABU S. C. TALUQDAR, Proprietor, Students & Co., Cooch Behar.
THE STANDARD BOOKSTALL, Karachi.
MUNSHI SEETA RAM, Managing Proprietor, Indian Army Book Depôt, Juhi, Cawnpore.
THE PROPRIETOR, New Kitabkhana, Poona.
THE ASSOCIATION PRESS, Calcutta.

No. 1509/VIII-1.

FROM

A. L. HOYLE, Esq., I.C.S.,

DIRECTOR OF INDUSTRIES, CENTRAL PROVINCES,

Nagpur,

To

THE SECRETARY TO THE HON'BLE THE CHIEF COMMISSIONER,

COMMERCE AND INDUSTRY DEPARTMENT,

Central Provinces.

Nagpur, the 17th July 1920.

SIR,

I have the honour to submit the Annual Report on Coins dealt with during the year 1919-20 under the Treasure Trove Act, as required by the Chief Commissioner's Revised Book Circular No. IV-9. The prescribed Statements A and B showing details of Forms III and IV are appended.

There were reported during the year, from the various districts of the Province, seventeen finds, of which sixteen cases have been disposed of in the year, and the last find, the contents of which were received in April 1920, will be dealt with in the year 1920-21.

The following short accounts of the finds will, it is thought, not be without interest :—

1. A find of 1,100 copper coins was made by one Ganesha Gond of Kosbi, Tahsil Garchiroli, District Chanda, while digging in the compound of his master's house at Kosbi on the 3rd June 1918. The coins were found in a copper vessel. Had the find been in good condition it would have possessed remarkable interest. Only 47 coins out of the lot were acquired for distribution. This Museum gains some valuable specimens, *i.e.*, the coins of Ahmad Shah, son of Humayun Shah Bahmani.

2. Malla, son of Paiku, Dhobi of Kansari, Tahsil Garchiroli, District Chanda, found 40 silver coins in an earthen vessel in his yard on the 20th September 1918. Seventeen coins were acquired for distribution. The find contained some coins of the Zaffarabad and Jahangirnagar Mints, which are rare.

3. One silver and 512 mixed metal coins were found in a metal pot in the Government Nazul land while digging for earth in village Umaria, Tahsil Sihora, District Jubbulpore, in the month of February 1919. Altogether 61 coins were acquired—1 silver and 30 mixed metal for distribution and 30 mixed metal coins for sale.

The mixed metal coins are of the type of the Early Sassanian coins of Sridama (10th Century A.D.), discovered at Gwalior in 1913-14. The silver coin is the Adivaraha Dramma of Bhojadeva, 1840 to 1890 A.D.

4. Fourteen silver and 115 copper coins were found in a brass *lota* by Kare, son of Tanto Mehra, of Kodoras, a village in the Tahsil and District of Narsinghpur, when he was driving his cattle to grass in the month of Magh (February 1919). The treasure was exposed by the hoofs of the cattle. The find contained common specimens, and only 8 silver coins were acquired for distribution, the rest being worthless.

5. A treasure of 221 silver coins was discovered in a copper *lota* by one Shama, son of Tukaram Dhobi, in a field called "Lalawali Khari" belonging to Vithal Rao, malguzar, and situated in mouza Kurumbad of the Ramtek Tahsil, District Nagpur, while sowing wheat.

The find is a very interesting one and it consists of some beautiful, rare and hitherto unknown coins. Almost all the rare specimens have come to this Museum. As many as 192 coins have been acquired for distribution from this find.

6. Twelve silver coins were found about a foot below the surface while digging up and levelling the playing field near the Mandla Jail, about 100 yards from the outer moat of the town.

The find being in good condition all the 12 coins were acquired. One coin of Shah Jahan III, a new specimen as regards the arrangement of the obverse, has come to this Museum.

7. Three thousand two hundred and two copper coins were discovered in village Gol of Hinganghat Tahsil, District Wardha, on 28th March 1918, in a Gauthan, at a depth of 1½ feet, lodged in an earthen jar.

Although a few coins only were in good condition, the find is very interesting. It contained coins of Abdullah Qutb Shah and Abul Hasan Tana Shah of Golkonda, Aurangzeb, and a doubtful piece of Islam Shah (?) of the Chunar Mint. One coin of the Golkonda type was first discovered in the same District and Tahsil in the year 1912-13. Only 93 coins were acquired.

8. Six hundred and ninty-two copper coins were discovered by children while playing in the malik-makbuza land in Patan, District Jubbulpore. The treasure was buried in a heap of earth. Almost all the coins were in a hopeless condition. They were of the Malwa type. Only 8 coins have been acquired for this Museum.

9. One hundred and ten silver coins were found in a brass *lota* imbedded in the public path by an Ahir boy, named Narayan, in the *abadi* area of Mouza Deshgaon, in the Khandwa Tahsil of the Nimar District. All these coins were good specimens, and all have been acquired for preservation.

10. Ninety-four silver coins were discovered in a field while ploughing in Rashankheir, Morsi Taluq, District Amraoti.

The find contained 64 good specimens. The remaining 30 being obliterated were not worth acquiring. Although the coins were not very rare, the Indian Museum accepted 19 specimens.

11. One hundred and eleven silver coins were unearthed during the recent demolition of a house at Morsi in the Amraoti District. The find contained common types and most of them were not in good condition. Only 40 coins were acquired.

12. Sixty-two silver coins were found by some boys on the surface of the ground in a ditch while grazing cattle in a field in Mouza Kundari, District Seoni. The father of one of the boys sold 17 coins to a *sonar* (goldsmith), who melted them down, and there thus remained only 45 coins, out of which 31 were acquired for preservation.

The coins melted down may have contained some interesting specimens. On the whole the find contained good specimens of the middle Moghal period.

13. A treasure of 115 silver and 3 copper coins was found by one Shankar Raghuji at Bhuisinga in the Malkapur Taluq of the Buldana District. The coins were discovered buried in the tomb of some Tapeshwari Boa.

The find is a very interesting one as the coins indicate marks of new mints, the identification of which is still a riddle. It is to be regretted that not a single specimen bore a complete legend. With the exception of a few, all the silver coins bear the same mint mark. Only 30 silver coins were acquired.

The copper coins were worthless.

14. Forty-six copper and 2 brass coins were found by one Holya Nagarchi in September 1918 in a grass plot of the village Dhara in the Tahsil and District of Balaghat. The coins discovered were corruptions of the Malwa and Gujrat types described in Numismatic Supplement No. XXIV (J. *A. S. B.*, Volume X, No. II, pages 461—485), of which 19 coins were acquired for preservation.

15. A treasure of 471 silver coins was discovered by a boy named Tukia in an earthen pot buried in the *abadi* land while digging earth on the 15th May 1919 at Mouza Dahegaon in the Ramtek Tahsil of the Nagpur District.

The find contained coins of Muhammad Shah, Ahmed Shah and Shah Alam II. The coins of the first two kings are of the common type, while those of the last named, being only three in number, had traces of the doubtful mint referred to in the 13th find. Only 21 coins were acquired, the rest being worthless.

16. Three hundred and seventy-six silver coins were found on the 7th November 1917 in a field—Dudha—in Mouza Umarkhedi, Tahsil and District Hoshangabad, by one Gurda Kirar in a brass *lota* while sowing the rabi crop.

It was a useful find. Bhopal coins of Shah Alam II had not come up in such numbers before. Altogether 58 coins were acquired, 2 for sale, 54 for distribution and 2 retained by the Numismatic Secretary who dealt with the coins.

From a total number of 1,627 silver, 5,160 copper and 512 mixed metal coins discovered in the Nagpur, Balaghat, Wardha, Chanda, Jubbulpore, Seoni, Mandla, Hoshangabad, Nimar, Narsinghpur, Amraoti and Buldana Districts of these Provinces, 584 silver, 167 copper and 60 mixed metal coins have been acquired during the year under report. The coins not acquired were worn out and worthless. The coins contributed by each district are as follows :—

Nagpur—213 silver; Balaghat—19 copper; Wardha—93 copper; Chanda—17 silver and 47 copper; Jubbulpore—1 silver and 68 copper (60 mixed metal and 8 Æ.); Seoni—31 silver; Mandla—12 silver; Hoshangabad—58 silver; Nimar—110 silver; Narsinghpur—8 silver; Amraoti—104 silver; and Buldana—30 silver.

Eight hundred and eleven coins acquired in the year were distributed as compared with 208 of the previous year. Fifty-eight silver and not 60, contributed by the Hoshangabad District, referred to in the last year's report, are included in the 811 coins.

All the coins acquired belonged to the Mediæval, Pathan, Suri and Moghal ages. There were a few altogether unknown and rare coins in the finds dealt with during the year under report. It is therefore proposed to bring out a short note on "The Rarities in the Central Provinces Numismatics."

I have the honour to be,

Sir,

Your most obedient Servant,

A. L. HOYLE,

Director of Industries,

Central Provinces.

STATEMENT

Classification, by metal and by the series to which they belong, of coins found in the various
Chief Commissioner's revised Book Circular

Districts wherein found.	Gold.									
	Ancient.	Mediæval.	Pathan.	Suri.	Mogha.	Oudh.	East India Company.	Illegible.	Undeciphered.	Total.
1	2	3	4	5	6	7	8	9	10	11
Nagpur										
Balaghat										
Wardha										
Chanda										
Bhandara										
Jubbulpore										
Saugor										
Damoh										
Seoni										
Mandla										
Hoshangabad										
Nimar										
Narsinghpur										
Betul										
Chhindwara										
Raipur										
Bilaspur										
Drug										
Amraoti										
Akola										
Buldana										
Yeotmal										
Total										

* The coins are

•A

districts of the Central Provinces and Berar and dealt with under the rules contained in No. IV-9, during the year 1919-20.

Silver.										Copper.										Grand Total.
Ancient.	Mediæval.	Pathan.	Suri.	Moghal.	Oudh.	East India Company.	Illegible.	Undeciphered.	Total.	Ancient.	Mediæval.	Pathan.	Suri.	Moghal.	Oudh.	East India Company.	Illegible.	Undeciphered.	Total.	
12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
...	...	...	...	213	...	...	...	...	213	...	...	...	...	...	...	...	...	...	...	213
...	...	...	...	...	...	...	...	...	...	...	...	19	...	...	...	...	...	...	19	19
...	...	...	...	...	...	...	...	...	...	...	...	73	1	19	...	...	...	...	93	93
...	...	...	...	17	...	...	...	...	17	...	...	47	...	...	...	...	...	...	47	64
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	1	...	...	...	...	...	...	...	1	...	*60	8	...	...	...	...	...	...	68	69
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	31	...	...	...	...	31	...	...	...	...	...	...	...	...	...	...	31
...	...	...	...	12	...	...	...	...	12	...	...	...	...	...	...	...	...	...	...	12
...	...	...	...	58	...	...	...	...	58	...	...	...	...	...	...	...	...	...	...	58
...	...	...	...	110	...	...	...	...	110	...	...	...	...	...	...	...	...	...	...	110
...	...	...	...	8	...	...	...	...	8	...	...	...	...	...	...	...	...	...	...	8
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...	...	...	...	104	...	...	...	...	104	...	...	...	...	...	...	...	...	...	...	104
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	30	...	...	...	...	30	...	...	...	...	...	...	...	...	...	...	30
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	1	...	...	583	...	...	...	...	584	...	60	147	1	19	..	...	...	...	227	811

of mixed metal.

STATEMENT

Classification, by metal, of coins found in the several districts of the Central Provinces Central Museum, Nagpur;

Districts.	Gold.									
	Nagpur Museum.	Indian Museum.	Delhi Museum.	Madras Museum.	Provincial Museum, Lucknow.	Lahore Museum.	Public Library, Shillong.	Archæological Museum, Poona.	Peshawar Museum.	Quetta Museum.
1	2	3	4	5	6	7	8	9	10	11
Nagpur										
Balaghat										
Wardha										
Chanda										
Bhandara										
Jubbulpore										
Saugor										
Damoh										
Seoni										
Mandla										
Hoshangabad										
Nimar										
Narsinghpur										
Betul										
Chhindwara										
Raipur										
Bilaspur										
Drug										
Amraoti										
Akola										
Buldana										
Yeotmal										
Total										

B.

and Berar and distributed to the various Institutions and others as recommended by the Curator, during the year 1919-20.

											Silver.									
Ajmere Museum.	Rangoon Museum.	Dacca Museum.	Bihar and Orissa Coin Cabinet, Patna.	Asiatic Society of Bengal.	Bombay Branch Royal Asiatic Society.	British Museum.	Calcutta Mint.	Decipherer.	For sale at Nagpur.	Total.	Nagpur Museum.	Indian Museum.	Delhi Museum.	Madras Museum.	Provincial Museum, Lucknow.	Lahore Museum.	Public Library, Shillong.	Archæological Museum, Poona.	Peshawar Museum.	Quetta Museum.
12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
...	...	...	...	...	...	...	...	...	...	...	80	35	31	6	2	1	17	21	7	4
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	..	...	...	...
...	...	...	...	...	...	...	..	...	...	...	..	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	12	...	5	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	..	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	22	1	8	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	4	...	1	...	...	...	3	...	...	1
...	...	...	...	...	...	...	...	...	...	...	21	6	4	3	5	4	1	1	1	1
...	...	...	...	...	...	...	...	...	...	...	27	36	21	5	2	...	2	2	8	...
...	...	...	...	...	...	...	...	...	...	...	2	1	2	...	...	...	1	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	22	36	12	3	5	...	8	...	5	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	4	2	2	2	2	2	2	2	2	2
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	195	117	86	19	16	7	34	26	23	8

STATEMENT

Classification, by metal, of coins found in the several districts of the Central Provinces
..... Curator, Central Museum,

Districts.	Silver—(*Concld.*)											
	Ajmere Museum.	Rangoon Museum.	Dacca Museum.	Bihar and Orissa Coin Cabinet, Patna.	Asiatic Society of Bengal.	Bombay Branch Royal Asiatic Society	British Museum.	Fitz William Museum, Cambridge.	Calcutta Mint.	Decipherer.	For sale at Nagpur.	Total.
1	33	34	35	36	37	38	39	40	41	42	43	44
Nagpur ...	1	2	2	3	...	1	...	...	...	...	...	213
Balaghat ...	...	...	...	...	...	...	...	...	...	...	...	...
Wardha ...	...	...	...	...	...	...	...	...	...	...	...	...
Chanda ...	...	...	...	...	...	...	..	...	...	...	...	17
Bhandara ...	...	...	...	...	...	...	...	...	...	...	...	...
Jubbulpore ...	...	...	...	...	..	...	...	...	...	...	...	1
Saugor ...	...	...	...	...	...	...	...	...	...	...	...	...
Damoh ...	...	...	...	...	...	...	...	...	...	...	...	...
Seoni ...	...	..	...	...	...	...	...	...	...	...	...	31
Mandla ...	1	...	...	1	...	1	...	...	...	...	..	12
Hoshangabad ...	2	1	2	...	...	1	...	1	...	2	2	58
Nimar ...	...	2	...	4	...	1	...	...	...	...	...	110
Narsinghpur ...	1	...	...	1	...	...	...	...	..	...	...	8
Betul ...	...	...	...	...	...	...	...	...	...	...	...	...
Chhindwara ...	...	...	...	...	...	...	...	...	...	...	...	...
Raipur ...	...	...	...	...	...	...	...	...	...	..	...	...
Bilaspur ...	...	...	...	...	...	...	...	...	...	...	...	...
Drug ..	...	..	...	...	...	...	...	...	...	...	...	...
Amraoti ...	...	4	...	7	...	2	...	...	...	...	...	104
Akola ...	...	...	...	...	..	...	...	...	...	...	...	...
Buldana ..	2	1	1	2	...	1	1	...	...	...	...	39
Yeotmal ...	...	...	...	...	...	...	...	...	...	...	...	..
Total ...	7	10	5	18	...	7	1	1	...	2	2	584

B.—(*Concld.*)

and Berar and distributed to the various Institutions and others as recommended by the Nagpur, during the year 1919-20.—(Concld.)

Copper.

Nagpur Museum.	Indian Museum.	Delhi Museum.	Madras Museum.	Provincial Museum, Lucknow.	Lahore Museum.	Public Library, Shillong.	Archæological Museum, Poona.	Peshawar Museum.	Quetta Museum.	Ajmere Museum.	Rangoon Museum.	Dacca Museum.	Bihar and Orissa Coin Cabinet, Patna	Asiatic Society of Bengal.	Bombay Branch Royal Asiatic Society.	British Museum.	Calcutta Mint.	Decipherer.	For sale at Nagpur.	Total.	GRAND TOTAL.
45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	213
7	...	5	...	...	...	3	...	1	...	...	...	...	2	...	1	...	...	...	...	19	19
10	7	5	3	2	...	3	4	2	3	2	3	1	3	...	3	...	...	...	42	93	93
23	9	2	...	11	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	47	64
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	4	...	2	2	2	2	2	...	1	1	1	4	2	...	2	2	...	..	30	68	69
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	..	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
..	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	31
...	...	...	...	...	...	...	...	...	..	...	...	...	...	...	...	...	...	...	..	...	12
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	58
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	110
...	...	...	...	...	..	...	...	...	...	...	...	...	...	...	...	...	..	...	...	...	8
...	...	...	...	...	...	..	...	...	...	...	...	...	...	...	...	...	...	..	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	..	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	..	...
...	...	...	...	...	...	...	...	...	...	...	..	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	104
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	..	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	30
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
51	20	12	5	15	4	8	6	3	4	3	4	5	7	...	6	2	...	...	72	227	811

FORM III.—Chief Commissioner's Revised Book Circular No. IV-9.

Classification, by metal and by the series to which they belong, of coins found in the districts of the Central Provinces and Berar and acquired for distribution to various Coin Cabinets, etc., during the year 1919-20.

Metal.	Ancient.	Mediæval.	Pathan.	Suri.	Moghal.	Oudh.	East India Company.	As yet undeciphered.	Total.
1	2	3	4	5	6	7	8	9	10
Gold ...	...	...	...	...	...	...	...	...	...
Silver ...	...	1	...	...	583	...	...	...	584
Copper ...	...	* 60	147	1	19	...	...	...	227
Total ...	..	61	147	1	602	...	...	...	811

* The coins are of mixed metal.

FORM IV.—Chief Commissioner's Revised Book Circular No. IV-9.

Distribution of coins found in the districts of the Central Provinces and Berar, as recommended by the Curator, Central Museum, Nagpur, during the year 1919-20.

Names.	Gold.	Silver.	Copper.	Total.
1	2	3	4	5
Nagpur Museum	...	195	51	246
Indian „	...	117	20	137
Delhi „	...	86	12	98
Madras „	...	19	5	24
Provincial Museum, Lucknow ...	...	16	15	31
Lahore Museum	...	7	4	11
Public Library, Shillong ...	...	34	8	42
Archæological Museum, Poona ...	...	26	6	32
Peshawar Museum	...	23	3	26
Quetta „	...	8	4	12
Ajmere „	...	7	3	10
Rangoon „	...	10	4	14
Dacca „	...	5	5	10
Bihar and Orissa Coin Cabinet, Bankipur, Patna.	...	18	7	25
Asiatic Society of Bengal ...	...	...	...	...
Bombay Branch Royal Asiatic Society ...	...	7	6	13
British Museum	...	1	2	3
FitzWilliam Museum, Cambridge ...	...	1	...	1
Calcutta Mint	...	...	...	...
Decipherer	...	2	...	2
For sale at Nagpur	...	2	72	74
Total ...	...	584	227	811

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CONTENTS.

	PAGE.
Staff	1
Arrangement of Report	1
PART I.	
Output of doses of anti-plague vaccine for the past five years	1
Distribution of anti-plague vaccine	2
Statistics of Inoculation	2
Inoculation in the villages of Dhárwár District	3
Observations on Inoculation	4
Research work (Plague)	5
Experiments to determine whether two small doses of vaccine were as efficient in producing immunity as a single dose...	5
Experiments to determine the best method of using Hydrocyanic acid gas for the destruction of rats and other vermin	6
Observations on the three species of *Xenopsylla* found in Bombay, Coonoor and Ootacamund	6
Assistance and advice rendered in connection with plague	7
Examination of rats for plague for the Bombay City Municipal Corporation ...	7
PART II.	
Examination of Pathological Fluids and Discharges and Water	8
Diagnosis of Rabies	9
Classification of pathological tissues	9
Snakes	10
Research Work	11
Guineaworm Disease	11
Tuberculosis in India	12
Salvarsan and its effects on rat-bite disease	18
Assistance and advice rendered	18
Educational—	
Lectures and Demonstrations...	14
School of Tropical Medicine	14

REPORT OF THE BOMBAY BACTERIOLOGICAL LABORATORY FOR THE YEAR 1914.

STAFF.

Staff.

1. The Director of the Laboratory was Major Wm. Glen Liston, C.I.E., M.D., D.P.H., I. M. S., throughout the year.

The Assistants to the Director were :—

(*a*) Major T. H. Gloster, M.B., D.P.H., I. M. S., from January to 12th June 1914 when he proceeded on leave and from 11th September to 17th October 1914; transferred to Military duty thereafter.

(*b*) Captain J. Taylor, M.D., D.P.H., I. M. S., acted as Assistant to the Director in place of Captain W. D. H. Stevenson, I. M. S., on leave from January to 4th September 1914.

(*c*) Captain W. D. H. Stevenson, M.D., D.P.H., I. M. S., returned from leave on the 5th September 1914 and was Assistant to the Director until the end of the year.

(*d*) Dr. D. A. Turkhud, M.B., C.M. (Edin.), Special Officer, was attached to the Laboratory during the entire year.

ARRANGEMENT OF THE REPORT.

2. The report is divided into two parts setting forth under separate heads the work done :

(*a*) as the Laboratory where all the anti-plague vaccine used in India and its dependencies is made, and where investigations connected with plague are carried out; and

(*b*) as the Bombay Bacteriological Laboratory where work connected with preventive medicine and pathological diagnosis for the whole of the Bombay Presidency is carried out.

PART I.

Work connected with Plague.

(*a*) Routine Work.

Output in doses of anti-plague vaccine for the past 5 years.

3. The table below gives comparative figures of output in doses of anti-plague vaccine for the past five years :—

1910.	1911.	1912.	1913.	1914.
625,690	1,211,170	727,377	735,637	812,942

This table and the following statement show that the number of doses of anti-plague vaccine despatched from the Laboratory this year has been larger than in any previous year except the year 1911. The increase in the demand for the plague vaccine was especially marked in Bengal, Behar and Assam; United Provinces; the Punjab; Central Provinces and Berar; Burma; and the Native States of India. A marked decrease in the demand for vaccine was noted in the Bombay and Madras Presidencies this year as compared with previous years.

Since the Laboratory was opened in 1896 up to the end of 1914 the total number of doses sent out has been 12,242,796.

The distribution of anti-plague vaccine.

The distribution of anti-plague vaccine in India and foreign countries during the last two years is shown below (figures represent number of doses) :—

Place or Province.	1913.	1914.
Bombay Presidency and Sind	220,575	96,217
Madras Presidency	119,460	43,375
Bengal, Behar and Assam	12,800	46,115
United Provinces of Agra and Oudh	126,192	205,425
The Punjab	46,800	91,750
North-West Frontier Province	1,170	2,110
Central Provinces and Berar	13,060	24,175
Burma	40,200	50,000
Native States in India	62,255	107,050
Countries outside India	152,625	146,650
Portuguese Territory in India	500	75
Total number of doses ...	795,637	812,942

The monthly despatch was as follows :—

Month.	1913.	1914.
January	46,315	125,885
February	61,760	119,300
March	56,898	75,501
April	52,010	33,566
May	8,185	16,095
June	8,475	4,705
July	20,140	5,655
August	131,775	65,495
September	124,015	27,180
October	151,165	128,180
November	93,116	88,615
December	41,785	122,765
Total number of doses ...	795,637	812,942

Statistics of inoculation.

Statistics of inoculation.

4. As usual a letter was addressed to all officers to whom anti-plague vaccine had been sent during the year asking them to favour us with any statistics they might be able to supply which showed the effect of inoculation on a plague epidemic. Although a large number of officers were kind enough to supply us with figures the majority of the statistics submitted were defective in one or more points of detail. We have not reproduced these statistics for this reason, although all show that the inoculated suffered less severely from plague than the uninoculated and that by adopting this measure for combating plague many lives were saved.

We reproduce below, however, some carefully compiled statistics from among certain small communities which show the value of inoculation in markedly lessening the incidence and mortality from plague. These statistics have been collected by Assistant Surgeon P. B. Potnis on Inoculation duty in the Dhárwár District and deal with epidemics which occurred in the villages of Shirol, Kurtakotti, Nargund, Konnur, Bankutty, Namally, Shalwadi, Madgunki and Amingeri.

Bombay Presidency, Dhárwár District.

Statistics comparing the effect of plague on inoculated and uninoculated persons in certain villages of the Dhárwár District:—

Names of Villages.	Number of houses.	Number of persons living in these houses.	Distribution according to sex and age.	Inoculated.									Uninoculated.							
				Sex.		Age-periods.							Sex.		Age-periods.					
				Males.	Females.	1—10.	11—20.	21—30.	31—40.	41—50.	61 and upwards.	Total.	Males.	Females.	1—10.	11—20.	21—30.	31—40.	41—50	61 and upwards.	Total.
Shirol ...	7	49	Number ...	22	0	5	6	9	2	0	0	22	8	18	5	8	5	3	3	2	26
			Attacks ...	0	0	0	0	2		0	0	2	0	0	1	3	1	0	1	1	7
			Deaths ...	0	0	0	0	0	0	0	0	0	0	0	1	3	1	0	1	1	7
Kurtakotti ...	4	29	Number ...	9	7	5	4	2	3	2	0	16	4	9	3	3		0	2	3	13
			Attacks ...	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	1	1	4
			Deaths ...	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	1	1	4
Nargund ...	42	173	Number ...	65	28	23	25	30	9	5	1	93	37	43	16	24	14	7	11	8	80
			Attacks ...	0	0	3	2	3	1	0	0	9	0	0	3	14	3	1	6	4	31
			Deaths ...	0	0	1	0	1	0	0	0	2	0	0	2	11	2	1	3	3	20
Konnur ...	20	96	Number ...	31	4	11	13	5	3	1	2	35	29	32	12	10	16	10	4	9	61
			Attacks ...	0	0	0	4	0	0	0	0	4	0	0	5	5	8	3	3	1	25
			Deaths ...	0	0	0	0	0	0	0	0	0	0	0	4	3	6	2	2	1	18
Bunkutty ...	6	24	Number ...	11	5	8	3	2	2	1	0	16	1	7	1	3	3	1	0	0	8
			Attacks ...	0	0	1	1	1	0	0	0	3	0	0	0	2	1	0	0	0	3
			Deaths ...	0	0	0	1	1	0	0	0	2	0	0	0	2	0	0	0	0	2
																	0				
Namally ...	3	11	Number ...	5	0	1	2	1	1	0	0	5	3	4	1	2	2	1	0	0	6
			Attacks ...	0	0	0	1	0	0	0	0	1	0	0	0	1	1	0	0	0	2
			Deaths ...	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	2
Shalwadi ...	8	41	Number ...	10	1	2	0	8	0	1	0	11	9	21	8	7	5	5	3	2	30
			Attacks ...	0		0	0	1	0	0	0	1	0	0	3	3	2	0	0	0	7
			Deaths ...	0	0	0	0	1	0	0	0	1	0	0	3	0	0	0	0	0	3
Madgunki ...	4	23	Number ...	11	5	6	5	3	2	1	0	16	2	5	1	2	3	0	1	0	7
			Attacks ...	0	0	0	0	0	0	0	0		0	0	1	2	1	0	0	0	4
			Deaths ...	0	0	0	0	0	0	0	0	0	0	0	1	2	1	0	0	0	4
Amingori ...	37	210	Number ...	73	24	23	20	16	12	13	2	97	54	59	27	23	17	14	8	24	113
			Attacks ...	0	0	5	5	2	0	2	0	14	0	0	5	0	7	5	0	6	32
			Deaths ...	0	0	1	1	0	0	0	0	2	0	0	2	7	7	2	0	6	24
Total ...	131	655	Number ...	237	74	97	86	76	34	23	5	311	146	198	74	82	67	41	32	48	315
			Attacks ...	26	8	9	13	9	1	2	0	34	41	75	19	40	24	9	11	13	116
			Deaths ...	3	4	2	2	3	0	0	0	7	29	55	14	30	18	5	6	11	84
Percentage of	...	...	Attacks ...	10	10·8	10	15	12	3	9	0	10·9	28	37	25	48	35	22	34	27	33·7
			Deaths ...	11·6	50	0	0	0	0	0	0	2·2	70	73	0	0	0	0	0	0	26·5

In almost all these villages many people left their houses when plague broke out; a certain number of persons, however, remained in the villages throughout the epidemic. In certain households all the inmates were inoculated, in certain other households none were inoculated. None of these households have been taken into consideration in the statistics detailed above. Only those houses in which inoculated persons were living together with uninoculated persons have been considered and moreover of these houses only those have been considered in which plague cases occurred at some date subsequent to the day on which the last person was inoculated in that house. We hoped in this way to exclude any influence which social status or habits might have on the prevalence of the disease and by taking into consideration only those houses in which plague appeared subsequent to inoculation we made more

certain that the inoculated were subjected to the same chance of infection as the uninoculated. Despite these precautions, however, there remained the possibility that the inoculated group did not exactly correspond to the uninoculated group. It was possible for example that owing to timidity or other cause the females might not be inoculated so frequently as the males or again that the age distribution in the two groups might not be exactly comparable. A careful house-to-house inquiry at the end of the epidemic was, therefore, made in each village ; the name, age, and sex of every person who had lived in the village during the epidemic was recorded and the fact was noted whether each person had or had not been inoculated or had suffered or died from plague.

Selecting the houses in all the villages in the manner mentioned above 131 households containing 311 inoculated and 344 uninoculated persons were available for the purpose of the present inquiry. Among the 311 inoculated persons there were 34 attacks and 7 deaths while among the 344 uninoculated there were 116 attacks and 84 deaths. The percentage incidence of the disease among the inoculated was thus 10·9 while among the uninoculated it was 33·7. The death-rate among the inoculated was 2·2 per cent. while the uninoculated had a death-rate of 24·4 per cent.

A further analysis of the figures showed that the two groups were not quite comparable in regard to sex and age distribution. Thus it will be seen from the table that among the inoculated there were 237 males and 74 females while among the uninoculated there were 146 males and 198 females. This difference in the distribution of sexes becomes of importance when it is noted that the incidence of the disease among the uninoculated females was 37 per cent. as compared with 28 per cent. among the males, showing that the females were more liable to contract infection. The sex distribution in the two groups is thus in favour of the inoculated group but even if allowance is made for this difference in the two groups inoculation had reduced the incidence of the disease nearly threefold. While the incidence of the disease was greater among the uninoculated females than among the males the case mortality rate in the two sexes was only slightly different being 73 per cent. of the uninoculated females and 70 per cent. of the uninoculated males.

The age distribution in the two groups differs mainly in respect that among the uninoculated the number of persons over forty is considerably larger than the number of the same age periods among the inoculated. At the lower ages, especially at the age periods 11—20 and 21—30, the inoculated are more numerous than the uninoculated. This uneven age distribution among the two groups favours the uninoculated, for the incidence of the disease is greatest at the age periods 11—20 and 21—30. From the table it will be seen that while the incidence of the disease among the uninoculated at all ages was 33·7 per cent. the incidence was greater than this mean figure at the age periods 11—20, 21—30 and 41—50, the percentage incidence at these ages being respectively 48, 35 and 34. At the age periods 1—10, 31—40 and 51 and upwards the percentage incidence among the uninoculated was 25, 22 and 27. We can divide the inoculated and uninoculated members of these households each into two groups according as they belonged to age periods more or less prone to infection as shown by the figures above. If this is done then we find among the inoculated 185 persons belonging to the more severely infected age periods and 126 to the less severely infected age periods. The corresponding figures among the uninoculated are 181 and 163 respectively, on the whole therefore any disparity in the age distribution of the two groups favoured the uninoculated though only to a very small extent.

Without taking into consideration the sex and age differences in the constitution of the two groups we can calculate that if the inoculated had suffered to the same extent as the uninoculated they should have had 104 attacks in place of 34 only. If a correction is made for the larger number of males among the inoculated as compared with the uninoculated we might have expected the inoculated to have had 94 attacks in place of 34 only. If a correction is made for the disparity in the age distribution in the two groups, the inoculated might have been expected to have had 106 attacks in place of

34 only. We may conclude then that the uninoculated were attacked three times more frequently than the inoculated.

Passing on to consider the case mortality we find that 72 per cent. of the uninoculated who were attacked died while only 20 per cent. of the inoculated who were attacked succumbed to the disease. It has been pointed out that among the uninoculated the case mortality among males and females was approximately 70 and 73 per cent. respectively. When we consider the death rate among the inoculated we have to deal with very small figures but it may be noted that among 26 inoculated males who were attacked, only three died giving a case mortality rate of a little over 11 per cent., while of eight females attacked as many as four died giving a case mortality rate of 50 per cent. The ages of the inoculated females who died were 21, 13, 7 and 4. Except the female aged 21, who received 3·6 c. c. of the vaccine, the dose of vaccine given to the others was very small. We may calculate that if the inoculated had suffered as severely from plague as the uninoculated they should have had 76 deaths in place of 7 only. But if allowance is made for the difference in the sex constitution of the two groups we might have expected 66 deaths in place of seven only. We will therefore not be far wrong if we say that the inoculated had nearly ten times fewer deaths than the uninoculated.

Having thus taken into consideration only those houses in which inoculated were living beside uninoculated and in which plague cases occurred at some date subsequent to the last inoculation in each house, we find that in these villages in the Dhárwár District in which investigations were made inoculation probably saved sixty lives.

These figures show that the vaccine as at present issued from the Laboratory maintains a high degree of efficiency.

(*b*) Research Work.

I.

Experiments to determine whether two small doses of vaccine were as efficient in producing immunity as a single large dose.

5. A number of experiments on rats were made with the object of ascertaining the best method of carrying out inoculation. In previous reports from this Laboratory it has been shown that the practical success of an inoculation campaign depends on two important factors:—

(*a*) the degree of immunity conferred by inoculation; and

(*b*) the reaction (fever, pain at the site of inoculation, etc.) which follows inoculation.

The most successful campaign is that one in which the immunity conferred by inoculation is of a high order and in which, at the same time, the reaction after inoculation is slight. Unfortunately it has been observed that the greatest protection from plague infection has been obtained with vaccine which caused a severe reaction in the doses usually prescribed. The severity of the reaction in these cases has sometimes deterred people from submitting themselves to the operation so that, although the protection conferred on the inoculated is of a high order, fewer persons undergo the operation with the result that in the end fewer lives are saved.

With the object of devising a means for lessening the reaction experiments were made on rats to ascertain whether as great or greater immunity would be conferred on the animals by dividing the dose used into two parts, inoculating one part first and a second part a week later. These experiments showed that the method of using two small doses in place of one large dose conferred greater immunity on rats. Observations on man proved that small doses of a strong vaccine were followed by only a slight reaction and double the original dose administered a week later was tolerated well. When staff and time permit we recommend inoculators to give a small initial dose of from 1 to 2 c. c. of the vaccine (the exact dose being regulated according to age, sex, physical fitness, etc.) to be followed a week later by a second dose of from 2 to 4 c. c. of the vaccine.

Observations on man and experiments on rats show that in this way the severity of the reaction may be lessened and a high degree of immunity obtained. The only drawback to this method of administering the anti-plague vaccine is found in the fact that the repetition of the operation necessitates an increase in the staff required for carrying out the operations and a number of persons will be inadequately protected if they refuse or fail to obtain the second injection.

II.

Experiments to determine the best method of using Hydrocyanic Acid Gas for the destruction of rats and other vermin.

6. During the year further experiments were made with Hydrocyanic Acid Gas for killing rats and other vermin. A number of different methods and machines were devised for generating and diffusing the gas in rooms. Satisfactory progress has been made with these experiments and many of the difficulties encountered have been overcome; we hope to be able to test this method of killing rats on a practical scale in plague-infected villages next year.

III.

The relative proportion of three species of *Xenopsylla* found on rats in Bombay, Coonoor, and Ootacamund.

7. In a January number of the British Medical Journal, page 88, a letter was printed from Dr. Hirst of Colombo in which he stated that an examination of certain fleas caught on rats in Colombo and Madras City showed that they belonged to a species which closely resembled but which was not identical with the common species found on Bombay rats (*Xenopsylla cheopis*). The Honourable N. C. Rothschild named this new species *Xenopsylla astia*.

Dr. Hirst's note does not state what proportion of the fleas found on the rats of Colombo or Madras belonged to this new species but he suggested that the observation might be of importance in explaining the comparative freedom of Madras and Colombo from plague epidemics.

Following the publication of Dr. Hirst's letter an interesting and important paper on "Three Species of Xenopsylla occurring on Rats in India" was published by the Honourable N. C. Rothschild, M.A., F.L.S., in the Bulletin of Entomological Research, Vol. V, Part I. This paper clearly details the differential characters of the three species. Mr. Rothschild remarks: "The three species are very much alike and can only be distinguished with certainty under a good microscope. A hand lens is absolutely useless for the purpose."

A careful examination of fleas caught on rats in Bombay, Coonoor and Ootacamund belonging to the three species of Xenopsylla was made with the following result.

Proportion of *Xenopsylla brasiliensis, cheopis* and *astia* found on the rats in Bombay :—

	Male.	Female.	Total.	Percentage.
X. brasiliensis	3	*Nil.*	3	0·84
„ cheopis	126	161	287	80·6
„ astia	21	45	66	18·5
Total ...	.....	.....	356	.....

Proportion of *Xenopsylla brasiliensis, cheopis* and *astia* found on the rats at Coonoor :—

	Male.	Female.	Total.	Percentage.
X. brasiliensis	62	46	108	11·9
„ cheopis	453	338	791	87·5
„ astia	2	3	5	0·5
Total ...	.....	.....	904	.....

Proportion of *Xenopsylla brasiliensis, cheopis* and *astia* found on the rats at Ootacamund :—

	Male.	Female.	Total.	Percentage.
X. brasiliensis	4	5	9	8·1
„ cheopis	43	59	102	91·9
„ astia	*Nil.*	*Nil.*	*Nil.*	*Nil.*
Total ...	.....	.....	111	.....

It is interesting to observe that in all the three places *X. cheopis* constituted the overwhelming majority, over 80 per cent. of the fleas of the three species. *X. astia* was more common in Bombay than in Coonoor or Ootacamund while *brasiliensis* was more common in the latter places than in Bombay.

(*c*) Assistance and Advice rendered.

Examination of rats for plague.

8. The Health Department of the City of Bombay sent daily for examination all rats found dead or caught alive within the bounds of the Municipality. As a note is received with the rats indicating where each rat has been found, it is possible to inform the Health Officer of the City where plague-infected specimens have been picked up, he was thus able to adopt suitable measures to observe and check the progress of the disease throughout the city. During the year 644,241 rats were received at the Laboratory from the Health Department; 342,182 were alive when received, and 302,059 were dead; of the latter 210,080 were examined and among them 12,530 were found to be plague-infected.

The following table shows the progress of plague each half month among men and rats in Bombay. The figures which refer to men record the number of deaths from plague each half month. The figures showing the progress of the disease in rats are given separately for *Mus rattus* and *Mus decumanus*. These figures have been calculated from the number of rats found infected at the examination made at the Laboratory on every day of the week except Sundays and holidays; from the actual figures obtained on the days on which examinations were made a figure has been calculated for all the days of each half month and these figures are recorded:

Return of rats examined during the year 1914.

	Human plague mortality.		Plague-infected *rattus*.		Plague-infected *decumanus*.	
	Number of deaths from plague.	Percentage above and below mean for the year.	Figures calculated for each half month.	Percentage above and below mean for the year.	Figures calculated for each half month.	Percentage above and below mean for the year.
1914.						
1st to 15th January ...	20	− 33	93·7	− 22	397·5	− 23
16th to 31st January ...	37	− 60	139·4	+ 16	649·1	+ 26
1st to 15th February ...	45	− 63	188·7	+ 57	792·5	+ 54
16th to 28th February ...	69	− 43	211·5	+ 76	767·0	+ 49
1st to 15th March ...	158	+ 31	383·2	+219	1,215·0	+136
16th to 31st March ...	301	+149	353·2	+194	1,323·0	+157
1st to 15th April ...	492	+307	418·7	+248	1,780·0	+235
16th to 30th April ...	689	+428	376·2	+213	1,843·8	+257
1st to 15th May ...	597	+393	266·5	+122	1,346·5	+161
16th to 31st May ...	225	+ 86	126·8	+ 5	793·8	+ 54
1st to 15th June ...	107	− 12	68·1	− 43	365·8	− 29
16th to 30th June ...	38	− 69	33·7	− 72	198·7	− 61
1st to 15th July ...	42	− 65	18·5	− 85	156·9	− 70
16th to 31st July ...	35	− 71	20·6	− 83	158·1	− 70
1st to 15th August ...	21	− 83	34·1	− 72	132·3	− 74
16th to 31st August ...	32	− 74	30·7	− 74	122·7	− 76
1st to 15th September ...	20	− 83	16·2	− 87	87·5	− 83
16th to 30th September ...	12	− 90	12·3	− 90	114·5	− 78
1st to 15th October ...	8	− 93	30·0	− 75	64·6	− 87
16th to 31st October ...	2	− 98	24·0	− 80	53·3	− 90
1st to 15th November ...	1	− 99	17·5	− 85	22·5	− 96
16th to 30th November ...	5	− 96	10·4	− 91	15·0	− 97
1st to 15th December ...	3	− 98	3·5	− 97	12·7	− 98
16th to 31st December ...	1	− 99	8·0	− 93	18·7	− 96

PART II.

Work of the Laboratory as the Provincial Bacteriological Laboratory.

(*a*) Routine Work.

I.

Examinations of Pathological Fluids and Discharges, Waters, etc.

Pathological work done at the Laboratory.

9. A large number of specimens were received for examination.

I.—Blood Sera—

Of the 209 specimens examined, 68 gave a positive agglutinative reaction to B. typhosus; 2 to B. paratyphosus A; and one partially to B. paratyphosus B in dilutions of 1—20.

Blood Sera for the Wassermann reaction—

This test was performed in 240 cases, of which 96 were positive.

II.—Blood Smears—

Of 468 specimens examined, malarial parasites were present in 167 cases.
Differential leucocyte counts were made 13 times.
4 specimens of blood for Filaria were examined with negative result.
8 specimens were examined for the Micrococcus melitensis with negative results.
B. pestis was present in one case out of the 7 cases examined.
Blood cultures were made 42 times.

III.—Sputa—

125 specimens were examined; T. B. was found in 29 cases.

IV.—Throat Discharges—

22 specimens were examined for Diphtheria, of which 1 showed the presence of Bacillus diphtheriæ, and one an organism resembling B. Diphtheriæ.

V.—Pus—

9 specimens were examined; 1 showed the presence of gonococci.

4 slides were examined for the presence of Treponema pallida.

2 smears of pus were examined for B. pestis.

VI.—Fæces and Urine—

17 specimens of fæces and 79 specimens of urine were examined for various pathological conditions.

VII.—Foodstuffs—

2 specimens were examined.

VIII.—Milk—

5 specimens of milk were examined.

IX.—Water—

25 specimens of water were examined bacteriologically.

X.—Rats—

20 dead rats were received from outstations, of which 6 were plague-infected.

XI.—*Post mortem* examinations were held on 124 animals received for the most part from the Zoological Gardens of Bombay to ascertain the cause of death.

XII.—6 snakes, 2 squirrels, 6 mosquitos, 2 intestinal worms and 1 fly were identified.

XIII.—Miscellaneous specimens—

1 specimen from abdominal fluid; 3 of cerbrospinal fluid; 1 of ear discharge; 1 swab from uterine discharge; 2 specimens for cholera; 1 trypansome; 1 surra and 1 anthrax were examined.

II.

Diagnosis of Rabies.

Examination of dogs or rabies.

10. The examination of brains of dogs and other animals for the diagnosis of rabies was performed in 120 cases.

The brains were received from the following places :—

Bombay—			
Through the Bombay Veterinary College	...	71	
„ the Bombay Municipality	...	1	
„ the Bombay Port Trust	...	1	
„ the Bombay Police	...	5	
„ private owners	...	8*	
Colaba	... ...	3	
		——	89
Outstations—			
Dhárwár	... ...	5	
Násik	... ...	3	
Bándra (bullock's) ...	... ...	1	
Ahmedabad	... ...	3	
Khandála	... ...	1	
Ahmednagar (horse) ...	... ...	1	
Surat	... ...	5	
Lonand	... ...	1	
Belgaum	... ...	1	
Dhulia	... ...	1	
Jalgaon	... ...	2	
Andheri	... ...	3	
Poona	... ...	3	
Cambay	... ...	1	
		——	31
	Total ...		120

* One was from a cat.

Of the 120 brains which were received, nine arrived in such a condition that no examination could be made; thirty-four showed no evidence that they had been obtained from rabid animals. In the case of six brains although no definite "negri bodies" were found structures resembling these bodies were observed which raised the suspicion that the brains had been obtained from rabid animals. In seventy-one cases sections of the brains showed the presence of "negri bodies", these brains had apparently been removed from rabid animals.

III.

Pathological tissues received for diagnosis.

Classification of morbid tissues sent for examination.

11. During the year sections were cut and specimens examined in 339 cases. The following table shows the tumours and other morbid tissues examined at the Laboratory during the year 1914:—

I.—Tumours—		
A.—Non-malignant tumours—		
1. Ichthyotic wart	... ...	1
2. Papilloma	... ...	5
3. Villous papilloma	... ...	1
4. Cystoma	... ...	8
5. Adenoma	... ...	1
6. Fibro-adenoma	... ...	6
7. Adeno-myxoma	... ...	1
8. Lymph-adenoma	... ...	2
9. Lymphangioma	... ...	2
10. Hæmangioma	... ...	3
11. Fibroma	... ...	11
12. Soft fibroma	... ...	1
13. Fibro-myxoma	... ...	6

14.	Myxoma	...	...	1	
15.	Fibro-neuroma	...	...	1	
16.	Fibro-lipoma	...	...	2	
17.	Lipoma	...	...	2	
18.	Chondroma	...	...	1	
19.	Myoma	...	...	1	
					56
B.—Malignant Tumours—					
(*a*) 1.	Epithelioma squamous-celled	...	...	32	
2.	Epithelioma basal-celled	...	...	1	
3.	Adeno-carcinoma	...	...	6	
4.	Papillary adeno-carcinoma	...	...	1	
5.	Carcinoma simplex	...	...	8	
6.	Medullary or encephaloid carcinoma		...	6	
7.	Scirrhus carcinoma	...	...	8	
					62
(*b*) 1.	Round-celled sarcoma	...	...	14	
2.	Spindle-celled sarcoma	...	...	13	
3.	Mixed-celled sarcoma	...	...	4	
4.	Myeloid sarcoma	...	...	2	
5.	Myxo sarcoma	...	...	1	
6.	Myxo chondroma	...	...	1	
7.	Melanoma	...	...	5	
8.	Glioma of retina	...	...	1	
9.	Endothelioma including mixed parotid tumours		...	11	
					52
II.—Granulomata—					
1.	Tubercular	...	...	45	
2.	Syphilitic	...	...	9	
3.	Other Granulomata	...	...	8	
					62
III.—Inflammatory Processes, etc.—					
1.	Chronic inflammatory condition	...	...	7	
2.	Chronic abscess	...	...	1	
3.	Anthrax	...	...	2	
4.	Uterine scrapings (Endometritis)	...	...	6	
5.	Inflammatory uterine (Glandular erosion)		...	1	
6.	Guineaworm	...	...	1	
7.	Gangrene (acute)	...	...	2	
8.	Leprosy	...	...	1	
9.	Mycetoma	...	...	2	
10.	Non-malignant (other pathological conditions)		...	7	
11.	Chronic plague	...	...	1	
12.	Chronic piles	...	...	1	
13.	Polypus	...	...	1	
14.	Typhoid ulceration	...	...	1	
15.	Ulcers	...	...	4	
16.	Pathological conditions of various organs		...	34	
					72
IV.—Tissues in which nothing abnormal was noted in which no diagnosis was arrived at or diagnosis impossible					33
V.—Tissues received and diagnosis was impossible because of poor preservation or for some other reason					2

IV.

Snakes.

Snakes.

12. Poisonous Indian snakes are kept in the Laboratory for the purpose of obtaining a supply of venom for the manufacture of anti-venomous serum. The following table shows the number of snakes received during the year :—

Place.	Cobra.	Russell's viper.	Echis.	Krait.	
Bombay Presidency ...	15	27	280	2	324
Central Provinces ...	4	1	...	1	6
Rajputana ...	4	...	...	...	4
Total ...	23	28	280	3	334

(*b*) Research Work.

I.

Research in connection with Guineaworm Disease.

13. The study of guineaworm disease was continued throughout the year by Major Glen Liston, I. M. S., and Dr. Turkhud, M.B., C.M. (Ed.). An interesting investigation into the prevalence of the disease in the town of Ránebennur was made with the assistance of the Honourable Mr. Venkatesh Shrínivas Naik.

The town of Ránebennur has a population of 13,972 persons. At the time of our visit to the town there were 203 cases of guineaworm disease, that is to say, 1·45 per cent. of the population were suffering from the disease.

One hundred and twenty-eight males and 75 females were affected, they lived in 150 houses. The majority of the houses contained single cases, but 25 houses had 2 cases, 1 house had 3 cases, 3 houses had 4 cases, 1 house had 6 cases, and 1 had 8 cases. The large majority of the sick had one worm only; forty-four cases had two worms; eleven had three worms; seven had four worms; four cases had five worms; and four cases had nine worms. Single cases had six, seven, eight, ten and twenty-four worms each.

The water-supply of the town is derived from fifteen sources, *viz.*, eleven step-wells, two tanks and two draw-wells. All the persons who suffered from the disease obtained water either from the step-wells or tanks. Those who obtained their drinking water from the draw-wells were free from the disease.

Years have passed in a fruitless discussion of various plans to improve the water-supply of this town. All the schemes so far submitted have been too costly for the Municipality. Meanwhile the disease continues although much could even now be done to improve the existing sources of water-supply at small cost.

With the assistance of Mr. V. A. Dabholkar the prevalence of guineaworm disease in the village of Desai was investigated. This village has a population of 159 persons living in 39 houses. The sole water-supply of this village is a small well which becomes almost dry in the hot season so that at this time of the year the supply of water cannot be more than half a gallon per head of the population.

The population of the village was made up of 67 males and 62 females. Eight of the females had come to the village recently, they had married men resident in the village. There were also 30 children in the village. Excluding from consideration the children, we find that forty males and 25 females had been attacked by the disease at some time or other during their stay in the village. Twenty-seven males and thirty-seven females who had been long resident in the village and who used water from the same source as the other villagers never suffered at any time from the disease; these persons appeared to be immune to the disease. No explanation can be offered for this remarkable immunity.

If the eight females who had recently come to the village and the 30 children be excluded from consideration, then fifty-one persons or forty-two per cent. of the population who had been resident in the village for a number of years never suffered from the disease while 70 or 58 per cent. suffered at one time or another. The susceptibility to infection of those attacked by the disease seemed to vary for, of the 70 persons attacked 34 or 48·5 per cent. suffered almost every year, 15 or 21·4 per cent. had the disease often, 21 or 30 per cent. suffered from the disease once, twice, or thrice.

As in the town of Ránebennur so in the village of Desai, for some unexplained reason, the males suffered more frequently from the disease than the females, 60 per cent. of the former against 40 per cent. of the latter.

The figures obtained during this investigation show that on an average 24 men and 16 women are incapacitated for work for at least one month every year because of guineaworm disease in this village.

The following estimates for improving the water-supply of this village were prepared :—

No. 1—Capital Cost.

	Rs.
Deepening the well 10 ft.	130
Repairs to masonry wall	40
Reinforced concrete cover	100
Cast iron man-hole	30
Providing and fixing two Myer's pumps	150
Providing and fixing 1½" iron piping	50
Two iron cisterns 4 feet cube, capacity 400 gallons with 4 taps each	250
Total Rs. ...	750

No. 2—Annual Cost.

	Rs.
Wages of one man for pumps at Rs. 10 per mensem ...	120
Repairs to plant per annum	30
Interest on capital Rs. 750 at 6 per cent.	45
Depreciation at 5 per cent. for masonry	9
Depreciation on plant at 10 per cent.	45
Total Rs. ...	249

A capital expenditure of seven hundred and fifty rupees and an annual recurring expenditure of two hundred and forty-nine rupees would ensure the complete disappearance of guineaworm disease from this village.

The improvement of the water supply of this village is a business proposition. We can estimate that the loss of wages of twenty-four men at six annas a day for one month every year will amount to Rs. 270, and of sixteen women at four annas a day will amount to Rs. 120; while the wear and tear on the ropes and buckets used at present for drawing water by each family may be estimated at Rs. 2 per family per annum (39 families) or Rs. 78 for the whole village.

There is thus an annual loss in this village due to the present method of drawing and using water which, if expressed in money, would amount to about Rs. 468 per annum, but it has been shown that for an expenditure of Rs. 249 per annum guineaworm disease could be completely abolished from this village, not only would the villagers be saved the pain suffering and deformity attendant on this disease but they would make a net gain, if estimated in cash, of Rs. 219 per annum. I desire to draw the attention of Government to this subject in connection with their schemes for rural sanitation.

II.

14. The study of tuberculosis as it occurs in India was much interrupted during the year by the transfer of officers from the Laboratory to active service in connection with the war. This work was successively in the charge of Major Gloster, Captain Taylor and Captain Stevenson. Despite these changes in the staff engaged on the work considerable progress was made during the year. Dr. Soparkar, M.D., voluntarily took up the investigation on the departure of Captain Stevenson.

In the annual report for the year 1913 mention was made of an inquiry into the prevalence of bovine tuberculosis in this part of India. The importance of this investigation is obvious in view of the fact that great efforts are being made to apply to this country the rules and regulations adopted in Europe and America for the control of the milk and meat supply. These rules in Britain and America have been framed chiefly because of the prevalence of bovine tuberculosis in these countries and because of the danger of communicating bovine tuberculosis to human beings.

Our early investigations in Bombay showed that tuberculosis in cattle is a comparatively rare disease. Recognising, however, that our opportunities for obtaining material from infected cattle were not as satisfactory as might be, an endeavour has been made to study the question from another point of view, *viz.*: in how many cases of human tuberculosis can bacilli of bovine type be isolated?

Observations in Britain and America have shown that a fair proportion of young persons suffering from tubercular lymphatic glands are infected by the bovine type of tubercle bacillus. Working on these lines some progress has been made in the investigation of this problem. Fifteen strains of tubercle bacilli have so far been isolated and examined. Of these one was from a sputum, and one from tubercular axillary glands, while the remainder were from tubercular cervical glands. Classifying these strains isolated from cervical glands according to the age of the patients from which they were isolated, 4 cases were from adults of over sixteen years of age, and 8 cases were from children between five and sixteen years. In one case the age of the patient was not obtained. The importance of this classification arises from the fact that the majority of workers at this problem in Britain and America have found that tubercle bacilli of the bovine type are most frequently isolated from children (from 33 to 77 per cent. of cases under sixteen), and are comparatively rarely found in adults suffering from tubercular cervical adenitis. In not one of our cases has a strain resembling the bovine type been met with.

Many difficulties have been encountered in carrying on this investigation but these have been overcome and need not be mentioned here.

Doctor Soparkar has made some interesting observations on the vitality of the tubercle bacillus outside the body. He has shown that when sputum is exposed to the direct action of the sun in Bombay, the bacilli remain alive for six hours but are dead in eight hours. When tuberculous sputum is exposed in a well-lighted room but protected from the direct action of the sun, tubercle bacilli can be isolated from it alive six days after exposure but all the tubercle bacilli were dead in eight days. Tubercular sputum when kept in a dark cupboard, although completely dessicated over lime, still contained living bacilli six months after it had been deposited.

These observations have an important bearing on the methods adopted for the prevention of this disease. They show that sun-light is an important agent in destroying tubercle bacilli and that dark rooms in which the sputum of tubercular patients has been deposited may remain infected for months.

Other experiments which have a bearing on the vitality of the bacillus outside the body of man and animals and on the manner in which the tubercle bacilli may gain an entrance into the body of healthy animals are in progress. Full details of these experiments will be published in due course.

III.

15. A number of cases of "rat-bite" disease have come under observation. No definite causative organism has been observed or isolated from these cases; but the intravenous injection of "Salvarsan" has rapidly cured the most obstinate cases of this distressing fever although the patients failed to respond to other forms of treatment.

(*c*) Assistance and Advice rendered.

16. Captain Taylor, I. M. S., was deputed to Aden to make an inquiry into the existing water supply of that town and to ascertain what other sources of supply might be made available. The details of this inquiry have been published by Government in the form of a "Note on the Aden Water Supply" so that further mention of it need not be made here, other than to state that this inquiry has shed much light on the quality of the available supplies and much money might have been saved had the investigation preceded the undertaking of any work connected with the water supply.

17. The Laboratory has been able to assist the Medical Department of the Field Forces in a number of ways, for example, in the manufacture and supply of sealed tubes of Iodine and Potassium Iodide for the preparation of antiseptic lotion in the field. A large number of doses of typhoid and cholera vaccine and curative sera have also been supplied to the Forces. Autogenous vaccines have been prepared for the wounded under treatment in the Bombay Military and War Hospitals.

(*d*) Educational.

18. Lectures and demonstrations were arranged to instruct a number of school teachers and scholars in the causes and prevention of disease. Lantern slides and photographs have been supplied to a few persons and societies who specially desired to have these means of instructing the public. The facilities available in the Laboratory for preparing these slides and pictures are by no means adequate. Many District Sanitary Associations have appealed to us for help which frequently has to be refused because we are unable to cope with the demand.

19. Some progress was made with the plans and buildings for the proposed School of Research in Tropical Medicine.

20. The satisfactory working of this institution is due mainly to the loyal support and willing help I have received from the whole staff at all times.

W. GLEN LISTON, M.D., D.P.H.,
Major, I. M. S.,
Director, Bombay Bacteriological Laboratory.

BOMBAY: PRINTED AT THE GOVERNMENT CENTRAL PRESS.

REPORT

ON THE

ADMINISTRATION

OF THE

SALT DEPARTMENT OF THE BOMBAY PRESIDENCY

FOR THE

OFFICIAL YEAR 1905-1906,

WITH

APPENDICES.

BOMBAY
PRINTED AT THE GOVERNMENT CENTRAL PRESS
1906

No. 5447 of 1906.

From

W. H. LUCAS, Esquire, I.C.S.,
Collector of Salt Revenue, Bombay;

To

The Hon'ble Mr. R. A. LAMB, C.I.E., I.C.S.,
Commissioner of Customs, Salt, Opium and A'bkári,
Bombay.

Poona, 25th July 1906.

Sir,

I have the honour to submit the Annual Report on the Administration of the Salt Department for the year 1905-06. INTRODUCTORY.

2. I was in charge of the Department throughout the year. Collector's Office.

3. The Supervising Staff consisted at the end of the year of one Collector, ten Assistant Collectors and one Native Assistant to the Collector of Salt Revenue. Supervising Staff.

4. During the year under report, the following changes were made in the subordinate establishment, namely, that Strength of the Department.

(1) Out of the establishment employed at the Salt Depôt, Ahmedabad,

	Rs.	a.	p.
1 Clerk	40	0	0
1 ,, ...	30	0	0
1 ,, ...	25	0	0
1 Havildár	14	8	6
3 Peons	8	11	6 each
3 ,, ...	7	12	0 each

were reduced as per Government Resolution, Revenue Department, No. 6639, dated the 17th August 1905, and 1 clerk on Rs. 35 was entertained instead; and

(2) Under Government Resolution, Revenue Department, No. 5173 of the 28th May 1906

	Rs.	a.	p.
3 Peons	10	0	0
2 ,, ...	9	8	0

belonging to my office were reduced and

2 Peons	12	0	0
3 ,, ...	11	0	0

were entertained instead with effect from the 1st of March 1906.

5. A summary of the constitution and operations of the Department as a whole is subjoined, the corresponding figures for 1904-05 being given for the purpose of comparison :— Summary of constitution and operations of the Department.

	1904-05.	1905-06.	Increase.	Decrease.
1. Number of Supervising Officers	12	12	.....	.....
2. Number of subordinate establishment	6,388	6,379	.....	9
3. Number of tálukas	38	38	.....	.....
4. Number of Saltworks	438	437	.....	1
5. Number of maunds of salt excised and imported by sea and land on payment of duty	93,21,209	98,49,235	5,28,026	.....
6. Number of maunds of salt delivered free and at nominal rate of duty	9,45,880	10,08,466	62,586	.....
7. Total number of maunds of salt excised, imported, delivered free or at nominal duty	1,02,67,089	1,08,57,701	5,90,612	.....
8. Total Revenue	1,91,73,254	1,54,97,086	.....	36,76,168
9. Number of offences enquired into	1,259	804	.....	455

INTRODUCTORY.

6. The financial results of the last year's administration as compared with those of the preceding four years are exhibited below :—

Year.	Gross receipts.	Expenditure.	Refunds.	Total of expenditure and refunds.	Net receipts.	Percentage charges on gross receipts.
	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
1901-02 ...	2,25,89,143 7 4	15,94,322 12 11	1,06,156 8 6	17,00,479 5 5	2,08,88,664 1 11	7 8 5
1902-03 ...	2,33,39,633 0 7	16,00,284 14 10	88,772 1 8	16,89,057 0 6	2,16,50,576 0 1	7 3 9
1903-04 ...	1,80,47,694 9 6	16,57,810 5 5	48,031 9 8	17,05,841 15 1	1,63,41,852 10 5	9 7 2
1904-05 ...	1,91,73,253 15 6	16,75,907 12 2	62,496 1 2	17,38,403 13 4	1,74,34,850 2 2	9 1 1
1905-06 ...	1,54,97,085 10 4	17,07,797 3 0	65,530 11 9	17,73,327 14 9	1,37,23,757 11 7	11 7 2

The percentages of charges on gross receipts is higher than in any of the preceding four years and is due to heavy decrease in revenue owing to reduction of duty.

SALT.

Salt.

General sources of supply.

7. The salt with which the Bombay Presidency Salt Department has to deal may conveniently be classified under three heads :—

(1) Barágra salt manufactured from salt brine at the Government salt-works on the Runn (Khárághoda and Udu) now called the Pritchard Salt Works.

(2) Sea salt produced at works on the coast, of which one at Dharásna near Bulsár is a Government work. A few works, the property of Government, in the Konkan tálukas are leased to private individuals. All the rest of the sea saltworks are private.

(3) Imported salt produced mainly at saltworks in Portuguese India.

The figures in Appendix G will give an idea of the relative importance of these sources of supply.

Nominal duty salt is issued to Foreign Malabár and free salt to Janjira, Cambay, Pátri, Jhinjuváda and Rádhanpur States and sometimes in lieu of salt accidently lost at sea.

Distribution of Bara'gra Salt.

Bara'gra Salt.

Opening balance and season's product.

8. The quantity of Barágra salt in stock at the beginning of the year was 37,70,129 maunds against 41,63,204 maunds at the beginning of the previous year. The produce during the year under report amounted to 25,47,736 maunds, making with the quantity in stock a total of 63,17,865 maunds.

Removals.

9. The removals during the year amounted to 25,57,917 maunds as against 23,15,496 maunds in 1904-05 and 22,70,210 maunds in 1903-04. This substantial increase of nearly two and a half lákhs of maunds over last year's figures can only be attributed to the further reduction of eight annas in the rate of duty. An increase is to be observed nearly everywhere, but it is most noticeable in the case of the Central Provinces, the United Provinces of Agra and Oudh, and Málwa. An interesting fact to be noted in this connection is that Barágra salt was sent to 13 new stations in the United Provinces in the year under report.

Distribution of Barágra Salt.

10. The manner in which the issues of Barágra salt were distributed during the year under report is shown in Appendix A.

Distribution considered according to destination.

Local consumption.

11. The issues for local consumption are given in detail in Appendix B. It will be seen that, compared with the removals during 1904-05, there has been an increase during the year under report in the removals to all places except Rewa Kántha Agency, Káthiáwár Agency and Khándesh, where a slight decrease is noticeable. In the case of the Gáekwár's territory, while there is an increase of 5,000 maunds in the consumption of Barágra salt, there is, as a partial set off, a decrease of 1,600 maunds in the consumption of Dharásna salt. Similarly, there is a slight increase in the removals of Barágra and Dharásna salt taken together to places near the Jambusar and Cambay natural salt deposits. The increase in both these cases, though slight, is significant when

it is remembered that there was in the year under review a general falling off in the consumption of salt in the Surat Range consequent on an unfavourable agricultural season. In the case of Baroda it shows that the rules introduced in June 1905 for the prevention of the illicit manufacture and collection of, and contraband traffic in, salt in parts of the Gáekwár's territory, are producing the desired result, and in the case of places in the neighbourhood of the Jambusar and Cambay natural salt deposits it proves the efficiency of the establishment guarding these deposits.

Throughbooking system.

12. Salt traders availed themselves of 20 treasuries, the same number as last year, and of two railway stations, as against one railway station last year, Bamora on the Indian Midland Railway being the newly opened station. The subjoined statement shows how the different systems of payment of duty on Barágra salt have worked during the year under report compared with the previous year:—

Names of places at which duty was collected.	1904-05.	1905-06.
	Maunds.	Maunds.
Head-quarter Office, Bombay, Main Stores, Khárághoda, Ahmedabad Depôt and Broach Custom House.	10,04,973	11,85,831
At Treasuries beyond Presidency	8,44,188	8,84,262
At Stations on the Indian Midland Railway	11,742	10,197
	18,60,903	20,80,290

Loss and wastage.

13. The loss and wastage written off in the accounts amounted to 1,89,762 maunds against 2,28,460 maunds in the year 1904-05. The loss observed on clearance of the open stores alone amounted to 1,83,215 maunds and was due to the unprecedently heavy rainfall of July 1905. The percentage of loss and wastage comes to 3 as against 3·61 in the previous year.

Stock at the close of the year.

14. The amount in stock at Khárághoda at the end of the year was 35,70,186 maunds against 37,70,128 maunds at the close of the previous year. If 23,54,499 maunds manufactured during the manufacturing season of 1905-06 but stored and brought to account after the close of the year be added to it, the total stock will amount to only 59,24,685 maunds. As this amount is considerably less than the average annual demand plus two years' reserve, I have arranged to have 25 new pans opened during the coming season and hope permanently to increase the production of Barágra salt.

Cost price.

15. In 1904-05 the cost price of Barágra salt, calculated in accordance with the principles laid down by Government, was Re. 0-1-3 per Indian maund, but under the orders of the Government of India embodied in Government Resolution, Revenue Department, No. 2582 of the 28th March 1905, the cost price including all charges is now fixed at Re. 0-2-3 per maund.

Manufacturing season of 1905.

16. The following table contains details regarding the manufacture of salt at the Pritchard Salt Works during the season of 1905-06 :—

Salt Works.	Year.	Number of pans.	Total crop.	Average yield per pan.	Maximum yield per pan.
			Maunds.	Maunds.	Maunds.
Khárághoda ...	1904-05 ...	215	12,99,273	6,043	10,106
	1905-06 ...	215	11,97,018	5,567	9,072
Udu	1904-05 ...	185	12,46,248	6,736	8,977
	1905-06 ...	185	11,57,481	6,256	9,295
Total ...	1904-05 ...	400	25,45,521	6,389	10,106
	1905-06 ...	400	23,54,499	5,911	9,295

The number of pans worked during the year under report was the same as last year, but the quantity manufactured was less by 1,91,022 maunds,

owing to heavy and unseasonable rainfall in February last, which not only destroyed 20 per cent. of the salt in the pans but also affected the quality of the salt manufactured by weakening the brine, a consequence of which was that a much larger percentage than usual of the salt manufactured was condemned as unfit to be stored. Judging by the results obtained it is probable that had the season been normal, this year's crop of salt would have been even heavier than last year's which was a record one. Brine was let into the first pan at Khárághoda on the 19th October 1905 and into the last pan on the 24th November 1905. The first pan was cleared on the 30th March 1906 and the last pan on the 22nd April 1906. At Udu brine was let into the first pan on the 20th October 1905 and into the last pan on the 24th November 1905. The first pan was cleared on the 8th April 1906 and the last on the 16th May 1906.

Storage.

17. The storage operations began on the 23rd April and ended on the 26th May 1906. The daily average of the storage was 69,250 maunds against 77,137 maunds in the previous year. The storage was delayed on account of the deficient supply of labour consequent on a late cotton picking season. The engines were the same as those used last year. Though no breakdown occurred, they cannot be said to have worked satisfactorily; they are very old and quite worn out. The question of replacing them by new ones is under consideration.

Cost price paid to Agrias.

18. The quantity of salt on which cost price at one anna and three pies per Indian maund was paid to the Agrias during the manufacturing season of 1905-06 was 22,36,774 maunds and the amount paid for it was Rs. 1,74,748. This divided amongst 1,200 Agrias gives Rs. 146 per head for a working season of about six months.

Agency system.

19. As under the orders of the Government of India quoted in paragraph 15 of this report a uniform consolidated rate of issue price of Barágra salt has now been fixed and purchasers at agencies have to pay the actual railway freight, there is now no question of profit or loss in connection with the working of the agency system.

Water-supply.

20. The total rainfall at Khárághoda during the year under report was 39·42 inches against 7·85 inches during the previous year. This heavy rainfall was due to a cyclone which lasted for five days in July 1905, the quantity of rain registered during this short period being 32·67 inches. Fortunately this abnormally heavy rainfall did not cause any serious damage to life or property in Kháraghoda and Udu, but ensured a copious supply of water during the year under report. The only inconvenience experienced was that through railway communication between Khárághoda and Viramgám was cut off for nearly a month.

Health of Khárághoda.

21. The vital statistics of the new Government village at Khárághoda during the year under report read as follows:—There were 88 births or 39·3 per mille against 74 births or 35·1 per mille in the year 1904-05. The number of deaths was 66 or 29·5 per mille against 68 or 32·2 per mille in the previous year.

Population.

22. The population of the village was 2,240 during the year under report as compared with 2,108 last year.

Khárághoda Dispensary.

23. The total number of patients treated at the dispensary was 3,200 against 2,684 during the previous year. The most common diseases were, as usual, malarial fever, conjunctivitis, diseases of the digestive system and skin diseases. No epidemic prevailed during the year under report.

Advances to Agrias.

24. The total amount advanced to the Agrias as takávi during the year under report was Rs. 1,512 as against Rs. 4,004 last year. The decrease is due to fewer new Agrias having been employed during the year under report.

Sea Salt.

Produce and Sales.

25. The quantity of salt manufactured during the year was 95,23,284 maunds against 91,33,030 in the previous year, an increase of 3,90,254 maunds, due to the late setting in of last monsoon. The removals amounted to 79,95,356 maunds, that is to say, 3,40,815 maunds more than in the previous year. The increase in the quantity of salt manufactured raised the closing balance to 21,16,961 maunds against 11,72,885 maunds in the previous year.

26. At the Government saltworks at Dharásna the year opened with a balance of 95,277 maunds against 1,06,084 maunds in the previous year. The quantity manufactured during the year was 3,00,289 maunds against 3,38,613 maunds in the year 1904-05, the decrease being due to an unfavourable season. The removals during the year amounted to 2,95,116 maunds against 3,11,475 maunds in the previous year. The decrease of 16,359 maunds in the removals is due partly to the scarcity which prevailed throughout Gujarát last year and partly to the rumour which was abroad that the duty would be reduced in March last, a rumour which seriously affected removals during that month. Dharásna.

27. In the other saltworks, private and leased, the produce was 92,22,995 maunds against 87,94,417 maunds in the previous year—an increase of 4,28,578 maunds, due, as already stated, to the lateness of the rains. The balance at the beginning of the year was 10,77,608 maunds against 98,926 maunds in the previous year, and the issues amounted to 77,00,240 maunds against 73,43,066 maunds. The closing balance was 20,20,937 maunds against 10,77,608 maunds in the previous year. Rest of the Presidency.

28. The quantities of sea salt which were removed for consumption within and without the Presidency from the sea saltworks in British territory during the year under report compared with those of the previous year, are given in Appendix D. It will be noticed from the statement that there has been an increase of 2,80,099 maunds in the removals from saltworks near Bombay for consumption within and without the Presidency exclusive of Foreign Malabár. An increase of 1,12,560 maunds in the removals of nominal duty salt to Foreign Malabár raises the total excess over the previous year's figures to 3,92,659 maunds. Distribution of sea salt.

29. There has been an increase of 2,30,134 maunds in the removals of salt from saltworks near Bombay to the Central Provinces and of 8,214 maunds in the removals to Central India. Similarly, the removals of Barágra salt to these places show an increase of 43,260 maunds and 94,714 maunds respectively. Removals to Central Provinces and Central India.

30. The removals to the Nizam's territory show an increase of 1,55,721 maunds. This increase is remarkable as it follows upon an increase of 1,50,055 maunds last year. So also the removals to Calcutta, Foreign Malabár and Mysore show an increase of 1,40,864, 1,12,560 and 33,761 maunds, while removals to the Madras Presidency fell off by 1,37,525 maunds. The increase in the case of Calcutta is chiefly to be attributed to the Swadeshi movement under the influence of which large purchases of Bombay salt were made in preference to Liverpool salt. As regards the Madras Presidency, the decrease occurred solely in the removals to British Malabár, for in the rest of the Presidency there was an increase of 17,508 maunds. The decrease in regard to British Malabár is explained by the fact that stocks were more than fully replenished last year, the quantity of salt removed there being 13,19,000 maunds as against an average of 12,00,000 for the previous five years. Removals to Nizam's Territory, Calcutta, Madras Presidency, Foreign Malabár and Mysore.

31. Practically all the issues from Umbergaon, Shiroda and Sanikatta are for local consumption and the variations in them are too slight to require explanation. Umbergaon, Shiroda and Sanikatta.

32. The loss and wastage at Dharásna amounted to 4,426 maunds against 37,945 maunds in the previous year—4,242 maunds by over-estimation and 184 maunds by floods. The percentage was 1·11 against 8·5 last year. The amount of loss from over-estimation was only 4,242 as against 37,815 last year. This satisfactory result is due to the Assistant Collector himself having supervised the work of measuring and estimating the heaps. Such satisfactory results of course can be secured only in large individual salt works such as Dharásna and not in groups of small salt works. Loss and wastage at Dharásna.

33. At the other sea saltworks the loss and wastage amounted to 5,79,425 maunds against 4,72,670 maunds in the previous year as per details below :— Rest of the Presidency.

	Maunds.
Wastage from moisture	83,676
Loss by over-estimation	4,30,472
„ by flood	32
„ by theft	72
„ by destruction of unsaleable refuse salt	65,173
	5,79,425

The percentage of loss and wastage is 5·6 against 5·3 in the previous year.

34. The following table shows the maximum, minimum and average prices of salt of the Northern and Middle Konkan, Shiroda and Sanikatta salt-works :—

	Northern and Middle Konkan.		Shiroda.		Sanikatta.	
	1904-05.	1905-06.	1904-05.	1905-06.	1904-05.	1905-06.
	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
Maximum per maund.	0 12 0	0 6 0	0 8 0	0 6 0	0 7 0	0 6 0
Minimum do. ...	0 0 3	0 0 1	0 2 0	0 1 0	0 4 0	0 4 0
Average do. ..	0 2 6	0 1 10	0 6 0	0 4 5	0 4 8	0 4 8

Very few transactions took place at the highest and lowest prices. The rates generally prevailing were 4, 2, 1 annas per maund in the Northern and Middle Konkan, and 5 and 4 annas per maund at Shiroda and Sanikatta. The average rates are lower than those of the preceding year in consequence of an abundant supply of salt in the market throughout the year.

Imported Salt.

Quantity and distribution of imported salt.

35. The quantity and distribution of salt imported into the Bombay Presidency are given in Appendix E.

Goa Salt.

36. The quantity of Goa salt imported during the year was 2,83,082 maunds against 2,80,358 maunds in the previous year. The increase is too slight to require explanation. Most of the salt imported was consigned to Belgaum, Dhárwár, Madras and Mysore. Madras shows a decrease of 15,183 maunds and Mysore an increase of 9,367 maunds. The variations are unimportant and are due to ordinary trade fluctuations.

Through Salt.

37. No duty-paid through salt was imported at Castle Rock during the year under report.

Consumption.

Consumption for the whole of the Presidency.

38. The total quantity of salt issued for consumption in the Bombay Presidency amounted to 28,16,259 maunds as detailed in the margin. Taking the population at 2,09,74,649 according to the census of 1901, the average per head is 11·05 lbs. against 11·68 lbs. in the previous year.

	Maunds.
Barágra salt ...	4,77,627
Sea salt ...	20,84,830
	25,62,457
Add—	
Imported salt for local consumption ...	2,53,802
	28,16,259

In Gujarát.

39. The quantity of salt removed for consumption in Gujarát was :—

	Maunds.
Barágra salt for local consumption	4,77,627
Dharásna salt	2,83,550
Konkan salt	18,199
	7,79,376
Add—	
Imported salt	18
	7,79,394

This quantity distributed amongst a population of 60,24,402 gives an average of 10·65 lbs. per head against 10·60 lbs. last year.

40. The quantity of salt issued for local consumption in other parts of the Presidency, *viz.*, the Konkan, the Deccan, the Southern Marátha Country and North Kánara, may be estimated as under :— In the rest of the Presidency.

	Maunds.
Quantity of salt issued for the whole Presidency ...	28,16,259
Deduct—	
Quantity of salt issued for Gujarát	7,79,394
Balance ...	20,36,865

The population affected being taken at 1,49,50,247 souls, the average per head comes to 11·21 lbs. against 12·11 lbs. in the previous year.

41. A statement showing the average market prices of salt in each district of the Presidency during the calendar years 1902, 1903, 1904 and 1905 is appended, *vide* Appendix H.

As explained in the Administration Reports for 1903-04 and 1904-05, the cyclone of May 1903 disorganized the sea salt market and raised and maintained the price of salt at an abnormally high rate. The market continued in this disturbed state till after the monsoon of 1904 and therefore a comparison between the prices obtaining last year and those obtaining in 1903 and 1904 cannot be relied upon as showing accurately to what extent the consumer has benefited by the reduction of duty. If, however, the recorded prices for the year 1902 when the duty was Rs. 2-8-0 per Indian maund and those for last year when duty was Rs. 1-8-0 are taken as the basis of comparison, it will be seen that in twelve of the eighteen districts of the Presidency the reduction in price has been nearly equal to, or has exceeded the difference of, one rupee in the two rates of duty ; that in five of the remaining six districts the reduction has varied from 10 to 12½ annas and that only in the case of the Dhárwár District has it been strikingly small, namely, 4 annas 3 pies only. It is not apparent why in this district alone the fall in price should have been so small, when even in Bombay City, where the price of salt is always maintained at an artificially high level, the reduction in price has amounted to just eight annas.

The fact that in some districts prices have fallen to an extent greater than is to be accounted for by the difference in the rates of duty is due to two causes. The amount of capital locked up in the business has been diminished by nearly two-fifths, and interest charges have accordingly been lessened ; and the price of salt at the works, *ex* duty, has been extraordinarily low this year. At one time an ânâ (80 maunds) of good salt could be had for Rs. 6 or 1½ anna per maund.

I think the record of prices proves that in the greater part of the Presidency the benefit of the reduction of duty has been felt by the consumer to the fullest possible extent ; and that the reduction of one rupee has been proportionately of greater effect than the preceding reduction of eight annas.

This conclusion is confirmed by the examination of the figures of consumption. You have dealt with this aspect of the question in respect of the effect of the eight-anna reduction during the year 1904-05 in paragraph 10 of your review of the Administration Report for that year ; and the figures for the current year, which are given below, furnish abundant proof that a fresh stimulus has been given to consumption by the further reduction in the rate of duty.

Removals from Bombay Salt Works :—

		Maunds.	
1901-02	... ...	95,89,000	Duty Rs. 2-8-0. Normal conditions.
1902-03	... ...	92,13,000	Do. Do.
1903-04	... ...	87,33,000	Duty Rs. 2. High prices of sea salt.
1904-05	... ...	99,70,000	Duty Rs. 2. Prices of sea salt falling. Heavy removals to replenish stocks.
1905-06	... ...	1,05,53,000	Duty Rs. 1-8-0. Low prices of sea salt.

The increase in issues would have been greater but for the persistent rumours which prevailed throughout the time Their Royal Highnesses the Prince and Princess of Wales were in India that there would be a further reduction in the rate of duty to commemorate their visit. These rumours induced traders to keep their stocks as low as possible till the presentation of the last Budget at the end of March.

An incidental result of the reduction in the rate of duty is that the smuggling of salt has become far less profitable and consequently far less rife, for now-a-days a man can hardly expect to make four annas profit out of one day's successful smuggling, so that the increase in consumption, taking it as a whole, is no doubt partly due to the fact that many people, who formerly used illicit salt, often of bad quality, no longer find it worth while to do so.

On the whole, therefore, there is good reason to be satisfied with the effect of the reduction of the salt duty in this Presidency.

SALT REVENUE.

Revenue and Expenditure.

Revenue and Expenditure.

42. The receipts and expenditure on account of Salt Revenue for the year under report are shown in Appendix I. An explanation of some of the chief items on both sides of the account showing increase and decrease is given below.

Items of increase in Revenue.

43. The increase of Rs. 91,235 under "Proceeds of sale of Government Salt" is due partly to increase in the sale of Barágra salt and partly to ground-rent and other charges being now merged in the issue rate, as explained in paragraph 15 of this report.

The increase of Rs. 3,863 under "Ground-rent at maundage rate" is the result of larger sales of sea salt in 1905-06.

The increase of Rs. 5,257 under "Overtime work fees" is explained by the fact that during January, February and March 1905 removals of salt were restricted to bare requirements, as a reduction of duty was expected to be announced in the Budget at the end of March; and in consequence of this there were unusually large removals in the following two months and traders paid for work done on Sundays and holidays.

Items of decrease in Revenue.

44. The decreases of Rs. 1,065, Rs. 1,34,475 and Rs. 35,70,920 under "Import duty by sea", "Import duty by land" and "Excise duty" respectively followed naturally upon the reduction in the rate of duty. But for this reduction there would have been increases instead of decreases under all these heads, as the removals of salt last year exceeded by about three lákhs of maunds those for the preceding year.

Appendix J shows what the transactions—cash and credit—have been during the past three years.

There is a decrease of Rs. 44,615 under "Ground-rent" (Khárághoda and Bulsár Saltworks) owing to ground-rent in Barágra salt being now merged in the issue price.

The decrease of Rs. 3,079 under "Farms of Government Saltworks" is due to the Government Saltworks at Mátunga and Bassein having been leased at a lower rental than in the previous year, in consequence of the losses suffered by the previous year's lessees.

The falling off of Rs. 16,271 in the receipts under "Cost price of salt supplied to fish-curers" is attributed to the scarcity of fish both in the Ratnágiri and Kánara Ranges during the year. The fishing season was a very bad one indeed, for the shoals of mackerel, sardines and other fish, which usually appear off the coast in the autumn and early winter, did not do so this year.

The decrease of Rs. 7,377 under "Recovery of Salt Agents' Bagging and Sewing charges" is due to salt traders preferring to provide their own bags instead of using those of the agents for the removal of Barágra salt beyond the Presidency.

Items of increase in expenditure.

45. The increase of Rs. 6,916 under "Pay of Subordinate Establishment" is due (1) to the entertainment of the establishment sanctioned in Government Resolution, Revenue Department, No. 55, dated the 6th January 1905, and (2) to a larger number of officers having been on leave.

The increase of Rs. 2,384 under "Grain Compensation" is explained by the fact that no payments were made under this head in the previous year.

The increase of Rs. 29,042 under "Peons' Clothing" is due to first year's clothing having been supplied in the year under report to the peons on the Northern Frontier and in the Presidency Division.

The increase of Rs. 4,865 under "Overtime work fees" is explained by a corresponding increase in the receipts under the same head. SALT REVENUE.

The increase of Rs. 17,931 under "Salt Purchase and Freight on account of Barágra salt" is due to increased production of Barágra salt.

The increase of Rs. 25,863 under "Salt Agents' Bagging and Sewing charges" is consequent on previous year's arrears having been paid in the year under report.

46. The decrease of Rs. 7,134 under "Superior Supervising Establishment" is due to the post of Collector of Salt Revenue having been held by a Senior Collector for six months in 1904-05 and that of Assistant Surgeon, Khárághoda, by an officer drawing Rs. 250 per month, whereas the present incumbent draws only Rs. 150. Items of decrease in expenditure.

The decrease of Rs. 5,080 under "Boats Stores and Repairs" is attributed to the fact that comparatively few repairs were needed during the year under report.

The decrease of Rs. 2,922 under "Rewards in Salt and Customs cases" is due to a smaller number of cases having been detected during the year.

The decrease of Rs. 13,978 under "Petty Construction" is explained by the fact that the reconstruction of the chowkies consequent on the re-alignment of the Daman Frontier was completed in 1904-05, and the outlay on departmental buildings was, therefore, much less in 1905-06.

The decrease of Rs. 11,801 under "Salt Purchase and Freight on account of removal of salt to fish-curing yards" is ascribed to an unfavourable fishing season.

The decrease of Rs. 8,075 under "Commission on sale of Barágra Salt" is due to payment of commission to the Government Salt Agents being discontinued.

Miscellaneous. MISCELLANEOUS.

47. The number of fish-curing yards open for business during the year was the same as last year, *viz.* 29—14 in the Ratnágiri District and 15 in the Kánara District. Fish-curing Yards.

48. Appendix K shows in detail the transactions at all the yards during the year under report. The total quantity of fish brought to be cured fell from 2,28,947 maunds to 1,22,512 maunds and the quantity of salt issued from 68,873 maunds to 36,331 maunds owing to the very unfavourable fishing season which has already been referred to in paragraph 44 of this report.

49. As the hauls of fish were unusually small this year, there was naturally a corresponding decrease in the quantity cured, only 94,925 maunds being removed from the yards as against 1,76,074 in the previous year. The proportion of the weight of fresh fish to each maund of salt issued was the same as last year, *viz.* 3·3. At all the yards in the Ratnágiri District the proportion was almost uniform as it was last year, while in the Kánara District it varied from 3 maunds to 6·79 maunds, due to the difference in the methods employed by the Ratnágiri and the Mapila fishermen, both of whom resort to the Kánara yards.

50. The financial results of the working of the yards during the year under report in the circumstances described in the preceding paragraphs have not been satisfactory. Still they do show a small net profit of Rs. 1,122-9-4 as against Rs. 9,375-4-10 in the previous year.

51. In the Ratnágiri District the yards at Jaigad, Ratnágiri, Málvan and Deobág have worked at a profit. Taken together, the yards in the Ratnágiri District show a net profit of Rs. 391-2-0 as against Rs. 7,218-15-10 in the previous year.

52. The yards in the Kánara District show a net profit of Rs. 731-7-4 against Rs. 2,156-5-0 in the previous year.

53. The details of offences against the Salt Law disposed of during the year under report are given in Appendix L. The total number of cases detected Offences

were 804 against 1,259, *i.e.*, 455 less than in the previous year. Out of these, 309 were of clandestine removal of natural salt—106 in the Northern Division and 203 in the Southern Division.

54. The number of cases of smuggling foreign salt across the frontier was 183 against 205 in the previous year. The cases detected on the Goa Frontier were 156 against 185 and on the Daman Frontier 23 against 13 in the previous year.

55. There were 26 cases of theft from saltworks against 29 in the previous year, while the quantity of salt stolen was 37 maunds as against 44 maunds.

The reasons for this general decrease in salt-smuggling cases have already been explained in paragraph 41 of this report.

56. The percentage of convictions to persons sent up for trial was 96·2 against 96·9. The sentences passed by the Magistrates were generally satisfactory during the year under report.

Payment of compensation awarded by the Mixed Commission.

57. No payments were made on account of awards of the Mixed Commissions of 1880, 1885 and 1892 during the year under report, and the balance remaining unpaid is therefore the same as last year, *viz.* Rs. 2,250-0-11. The non-payment of the balance was due to the failure of the persons entitled to the money to put in their claims.

Farms of Government Salt Works.

58. Under Government Resolutions in the Revenue Department, Nos. 6529, dated the 12th August 1905, and 8079, dated the 4th October 1905, the Government Saltworks at Mátunga and Bassein were leased during the year under report for one year for sums respectively of Rs. 24,001 and Rs. 25,171. The previous leases of these farms were also for one year and realised Rs. 30,600 and Rs. 27,151. The decrease in the rentals for last year was the natural consequence of the losses suffered by the previous year's lessees, as explained in paragraph 44 of this report.

Relations with Native States.

Baroda.

59. The rules for the prevention of the illicit manufacture and collection of salt and contraband traffic in salt in certain parts of Baroda territory, which were introduced in the early part of the year, worked well and would no doubt have shown more striking results had not last season been a poor one throughout Gujarát, and as a result the consumption of salt was less than what it would have been had the season been a normal one.

Cambay and Janjira.

60. The conditions of the conventions with Cambay and Janjira have, as before, been faithfully observed.

Concluding Remarks.

61. The most notable features of the year's administration has been the reduction of the duty of salt from Rs. 2 to Rs. 1-8-0. The reduction, it is true, was effected on 22nd March 1905, a few days before the close of the year 1904-05; but its full effect could not be felt until the year under report. To what extent the consumer has benefited by the measure has already been explained in some detail in paragraph 41 of this report. The increase in the removals of sea salt from 76 lákhs of maunds in 1904-05 to 80 lákhs of maunds in 1905-06 is, I believe, a direct result of this reduction in the rate of duty. It is true that except in Gujarát there has been a slight fall in the rate of consumption in this Presidency compared with the rate for the previous year, as the following figures explain :—

	Gujarát.	Rest of the Presidency.
1904-1905	10·60	12·11
1905-1906	10·65	11·21

But far more salt is used now than formerly for agricultural purposes and as food for cattle, and the increased removals of sea salt from the Bombay Presidency clearly point to increased rates of consumption in other parts of India. And contrasted with the rates for the previous three years, which are given below, or taken by itself, 11·21 lbs. of salt per head of population is quite a

satisfactory rate of consumption and is a further indication of the benefit accruing to the consumer from the reduction in duty :—

1901-02	...	8·91	11·4
1902-03	...	8·99	10·9
1903-04	...	9·9	10·7

62. The balance of salt in the sea saltworks including Dharásna on the 30th June this year was 60,81,584 maunds against 56,91,350 maunds on the same date last year. This balance includes the produce of the whole season less sales up to 30th June, whereas the balance shown in paragraph 25 above represents the balance at the end of the financial year and in the middle of the manufacturing season, and does not serve as a reliable guide to the sufficiency or otherwise of the stocks. The sales of sea salt during the year were 80 lákhs of maunds which represent average sales of 6⅔ lákhs of maunds a month. Next manufacturing season should be in full swing by the middle of next February. At an average rate of sale of 6⅔ lákhs of maunds we should require 53 lákhs of maunds before that date. This would still leave a balance of about 8 lákhs of maunds, which should be more than enough to provide for any unforeseen increase in demand. There is, therefore, no reason to fear either that our stocks will run short, or that prices will rise before next manufacturing season. With the large sales that have taken place during the year, it is hardly necessary to point out that had the duty remained at Rs. 2 per maund, the revenue of the Department this year would have been considerably greater than it was last year.

63. The throwing open of the trade in Barágra salt to private traders in pursuance of Government Resolution, Revenue Department, No. 2582, dated the 28th March 1905, has not appreciably affected the situation. Messrs. Nowroji Vakil & Co. continue to enjoy the practical monopoly of the trade as evidenced by the fact that their sales in the year under report rose from four to nearly four and a quarter lákhs of maunds, whereas the removals of salt by private traders to places within the Presidency where the agents had hitherto enjoyed a monopoly amounted only to 17,000 maunds. This seems to prove that for the present private traders cannot compete with the agents.

64. In accordance with the recommendations of the Salt Committee, which were accepted by the Government of India, the States of Cochin and Travancore were asked to arrange with their contractors to use sealed and specially marked bags for salt consigned to these two States. The Travancore Darbár has consented to this arrangement; but the Cochin Darbár has objected to it on the ground of expense and has proposed an altogether ineffective alternative, namely, the use of bags with special marks stitched upon them. I have already explained that no measure except the sealing of the bags can fulfil the object in view and that either the bags must be sealed or the present practice as regards both States be allowed to continue.

65. Another important matter arising out of the recommendations of the Salt Committee, which was referred to in the last Administration Report and which has since been settled, is the insertion of a condition in salt licenses requiring the maintenance in certain saltworks of a minimum reserve stock of salt equal to one-fourth of the average annual production. My proposals in the matter have been adopted by Government who, in their Resolution in the Revenue Department, No. 6169 of the 26th June 1906, have decided not to enforce the condition in the case of the two small private saltworks to which alone they could be made legally to apply, but have directed that it should be inserted in all future leases of the Government saltworks in the Thána and Uran Ranges. By this measure a reserve stock of 1½ lákhs of maunds will be ensured. It is true that such a small reserve is not likely to have any very great effect upon the market in times of short supply, and therefore the object in view, namely, the permanent increase of the stocks of Bombay salt, will not be sufficiently secured by this measure alone. But besides this, my scheme for a new set of saltworks at Bhándup, capable of turning out 15 lákhs of maunds of salt annually, has just been sanctioned by Goverment Resolution, Revenue Department, No. 6362 of the 3rd July 1906. When this scheme has been carried out, a similar condition as to the maintenance of minimum reserves will

be applied to these new works too, and then a permanent reserve stock of over 5 lákhs of maunds of sea salt will, it is expected, be ensured.

66. This year as well as last year every encouragement and facility has been given to the licensees of sea saltworks to start manufacture earlier than usual and to work their pans to their utmost capacity. As a result of these endeavours, for which all credit is due to the Assistant Collectors and the Sarkárkuns, the closing balance of salt on 30th June this year is 61 lákhs of maunds as against 57 lákhs on 30th June 1905 and this too although sales have been on a much larger scale than usual.

67. A sum of Rs. 25,000 has been allotted in the current year's budget for the new dockyard and premises for the Coast Guard Fleet, and detailed plans and estimates are in course of preparation and the work of fencing and demarcation has already been completed. The Military Department are pressing for the restoration to them of our present Dockyard and premises at Mazagaon and it is of the utmost importance that the balance of the necessary allotment should be made and the whole work completed before the end of the next financial year.

68. The preliminary arrangements in connection with the opening on the 1st April last of the new táluka of Shewa engaged a great deal of my time and attention during the preceding months. I frequently visited the new buildings which were in course of construction. I have also selected a suitable site for a new wharf and settled on the spot various other questions connected with the administration of the new táluka which was opened on the 1st of April and is now in good working order.

69. After inspecting in January and February last the most important of the natural salt deposits in the Surat Range, I submitted a special report to you on the necessity of converting the six-monthly establishment at present engaged in guarding and destroying natural salt formations into a twelve-monthly one and the sanction of Government to my proposal is awaited.

70. A feature of interest in the year's administration was the issue of duty-free salt for industrial purposes which has been sanctioned by the Government of India under certain conditions embodied in an agreement to be signed by the Companies seeking the concession. Five Companies availed themselves of the concession during the year under report, four of them requiring the salt for use in dyeing and bleaching processes and one for the manufacture of soap. The Bombay Branch of the Cawnpore Tannery applied for and has recently obtained the use of duty-free salt for the purpose of curing hides; and there is every probability that the same privilege will be taken advantage of by other Companies and industries.

71. Another event of the year's administration was the revision of the establishment of the Ahmedabad Salt Depôt, and the transfer from the Huzúr Deputy Collector, Ahmedabad, to the Superintendent of the Depôt of the work of weighing, and collecting duty on, opium imported from Baroda and Dungarpur.

72. In the course of another comprehensive tour I have visited again nearly every part of every Range and again have found the work of the Departmental staff to be most satisfactory.

Mr. Pogson, the Senior Assistant Collector, has been in charge of the Goa Frontier throughout the year and continues to maintain his extensive and important charge in a high state of efficiency. Mr. Pain, his Customs Manager, has done another year of excellent work at Castle-Rock. Among the Frontier Inspectors, Messrs. L'Estrange and Devlin have on the whole been the most active.

Mr. Bulkley was transferred to the Thána Range in October and remained in charge until the end of the year. He has made himself thoroughly acquainted with his new charge and has put new life into the Thána Range. I cannot speak too highly of his work. As Preventive Officer Mr. Stanyon has done excellent work both at Chendni Bandar and at Bassein. Mr. Heard White

has proved himself to be an acquisition to the ranks of Coast Guard Inspectors. Mr. Narayan Venkatesh Kallyanpur has mastered his new duties as Sarkárkun and done much good work in the Ghodbandar táluka. Messrs. Prangovind Lalbhai Patel and Ramchandra Yeshwant Phanse have again done good work at Mátunga and Bassein respectively.

Mr. Macnamara has done another year of consistently good work on the Northern Frontier. He has his large staff of Inspectors thoroughly in hand and has shown both tact and acumen in dealing with the difficult Customs questions which arise on the Káthiáwár Land Frontier. All of his Inspectors have worked well; but Messrs. DeSouza, Caldecott, Fletcher and Shaik are entitled to special mention. Mr. Fern has again conducted to my entire satisfaction the heavy and monotonous duties of Customs Manager, Viramgám. Mr. Sethna, as Sarkárkun, has been very useful at head-quarters.

Mr. Jardine, since his transfer to the Kánara Range last September, has been most active and diligent and has done much to improve the efficiency of the staff serving under him. Messrs. Regnaud, Newlands and Ringrow are the Inspectors who have given him the best assistance. Mr. Laughton, who was acting as Assistant Collector, Kánara Range, for the first five months of the year, continued to work hard and well in that capacity.

Mr. Lake's management of the Ratnágiri Range to which he was transferred in September has been efficient. All three of his Coast Guard Inspectors, Messrs. Walke, Sharman and Barford, show a record of good work; and of his Sarkárkuns, Mr. Sitaram Vinayak Karnik at Alibág and Mr. Narayan Mangesh Karande at Ratnágiri are specially commended.

Mr. Belcham, who succeeded Mr. Bulkley at Khárághoda in October last, has quickly settled down to and mastered his new work and is well suited for the important post which he holds. His report describes another successful year at the Pritchard Salt Works, where the Inspector Mr. Gulam Yasin again has given invaluable assistance. Mr. Davies at the Main Stores and Mr. Chandulal Lallubhai at the Ahmedabad Depôt have both done very well indeed.

Mr. Sinclair's administration of the Surat Range of which he was in charge throughout the year, has again been vigorous and efficient. Of his Inspectors, Mr. Smyth again is singled out for especial notice. Messrs. Neale and Cates have also worked very creditably. Of the Coast Guard Inspectors in this Range, Mr. Cursetji has been the most energetic and successful. Of the Sarkárkuns, Messrs. Maneklal, Jamietram and Bhulabhai are the most conspicuous.

Mr. Hutchinson was in charge of the Uran Range for the last half of the year, and already has done much to improve the state of his charge. He is an officer of great experience and capacity for work. Among the officers serving under him, Mr. Boyd as Preventive Officer, Mora, and Messrs. Jairam and Narayanprasad as Sarkárkuns of Uran and Karanja are specially commended.

Mr. Wadham was in charge as Assistant, Coast Guard Service, from the beginning of May till the end of the year. His sad and sudden death at the end of April has deprived the Department of an officer of wide experience and technical knowledge.

Mr. Threlfall, as Senior Coast Guard Inspector, worked with his customary energy and efficiency and so did Mr. D'Arcy who was in charge of the Harbour Beat.

Mr. Dayabhai Surajlal Thathi has again shown conspicuous ability in charge of the Chief Account Office.

Mr. Vinayakyrao Madhavrao Moray, the Native Assistant, has given me the best of assistance in all branches of the work of the Department. He possesses real ability and ripe experience.

To conclude with my own office establishment, this year again I have every reason to be satisfied with the work of all of its members. My new Head Clerk Mr. A. de Gouvêa-Pinto, who was appointed last October, has more than justified his selection for the post. He is a capable and efficient officer and one who

certainly before long will be qualified for higher appointments. Mr. Ganesh Nilkanth Joshi, who acted as my Chitnis for most of the year, has given me much useful assistance.

I regret to have to record the following five casualties among the higher subordinate staff in the year under report:—

Mr. H. L. Evezard, Inspector, Coast Guard Service, Bassein Beat, died in April 1905 after 23 years' service.

Mr. Govind Vithal Kelkar, Sarkárkun, Uran, died in September 1905 after 24 years' service.

Mr. N. S. Dantes, Inspector, Goa Frontier, Matna Beat, died in February 1905 after 14 years' service.

Mr. H. J. Lushington, Inspector, Northern Frontier, Jhinjuváda Beat, died in August 1905 after a year and a half's service. Mr. Lushington was an able and promising young officer and his death has proved a real loss to the Department.

Mr. Shankar Ghansham Relkar, Sarkárkun, Jaitápur, died in September 1905 after 20 years' service.

I have the honour to be,
Sir,
Your most obdient servant,
W. H. LUCAS,
Collector of Salt Revenue.

APPENDIX A.

Statement showing the distribution of Baragara Salt during the years 1904-1905 and 1905-1906.

	1904-1905.						1905-1906.					
	For Local consumption.	For export by Railway to Central Provinces.	For export by Railway to United Provinces of Agra and Oudh.	For export to Central India, including Málwa and Rájputána.	For export to Scindia's Territory, Bengal, &c.	Total.	For Local consumption.	For export by Railway to Central Provinces.	For export by Railway to United Provinces of Agra and Oudh.	For export to Central India, including Málwa and Rájputána	For export to Scindia's Territory, Bengal, &c.	Total.
	Mds. s.	Mds. s.	Mds. s.	Mds. s.	Mds. s.	Mds. s.	Mds. s.	Mds. s.	Mds. s.	Mds. s.	Mds. s.	Mds. s.
Khárághoda ...	44,475 20	5,12,940 0	9,93,435 0	3,06,219 0	...	18,57,069 20	57,471 20	5,56,200 0	10,74,061 0	3,91,503 0	3 0	20,76,258 20
Ahmedabad ...	57,782 0	...	...	764 0	...	58,546 0	58,325 0	...	...	...	...	58,325 0
Agencies ...	3,51,572 0	...	...	48,309 0	...	3,99,881 0	3,61,831 0	...	...	58,503 0	...	4,20,334 0
Total ...	4,53,829 20	5,12,940 0	9,93,435 0	3,55,292 0	...	23,15,496 20	4,77,627 20	5,56,200 0	10,74,061 0	4,50,006 0	3 0	25,57,917 20

APPENDIX B.

Statement showing in detail the Issues of Baragara Salt for Local Consumption during the years 1904-1905 and 1905-1906.

District.	From							
	Khárághoda.		Ahmedabad.		Agencies.		Total.	
	1904-1905.	1905-1906.	1904-1905.	1905-1906.	1904-1905.	1905-1906.	1904-1905.	1905-1906.
	Mds. s.	Mds. s.	Mds.	Mds.	Mds.	Mds.	Mds. s.	Mds. s.
Ahmedabad ...	6,873 20	4,517 20	56,495	57,101	49,359	54,312	1,12,727 20	1,15,930 20
Kaira ...	.....	3,090 0	70	41	76,256	80,484	76,326 0	83,615 0
Broach ...	4,017 0	5,562 0	...	...	...	...	4,017 0	5,562 0
Panch Maháls ..	.....	1,236 0	...	...	44,742	45,666	44,742 0	46,902 0
Gáikwár's Territory ...	18,722 0	27,158 0	122	182	88,290	84,804	1,07,134 0	1,12,144 0
Mahi Kántha Agency ...	2,345 0	1,850 0	1,063	1,001	32,625	35,721	36,033 0	38,072 0
Rewa Kántha Agency ...	.....	318 0	22	...	29,994	29,154	30,016 0	29,472 0
Pálanpur Agency ...	6,754 20	8,531 20	...	...	22,455	23,832	29,209 20	32,363 20
Káthiáwár Agency ...	1,540 20	1,308 20	10	...	...	...	1,550 20	1,308 20
Cambay ...	500 0	500 0	...	...	7,612	7,858	8,112 0	8,358 0
Bombay ...	2,481 0	3,279 0	...	...	171	...	2,652 0	3,279 0
Poona ...	6 0	.....	...	...	33	...	39 0	.....
Sholápur ..	.....	.....	...	...	35	...	35 0	.....
Khándesh ...	1,236 0	618 0	...	...	...	...	1,236 0	618 0
Sátara ...	.....	3 0	...	...	...	...	.....	3 0
Total ...	44,475 20	57,471 20	57,782	58,325	3,51,572	3,61,831	4,53,829 20	4,77,627 20

W. H. LUCAS,
Collector of Salt Revenue.

APPENDIX C.

Statement of the Produce and Sales of Salt manufactured in the Bombay Presidency for the year ending 1905-1906.

Divisions.	Tálukas.	Number of Sazas.	Number of Salt Works.	Balance at the commencement of the year.	Produce. Estimated contents of heaps.	Produce. Excess over Estimate of lots disposed of.	Produce. Total according to revised Estimates.	Total of Balance and Produce.
	Ahmedabad Collectorate.			Mds. s. t.	Mds. s. t.	Mds. s. t.	Mds. s. t.	Mds. s. t.
Gujarát Division.	Khárághoda ...	2	2	37,11,574 36 0	24,83,539 0 0	32,303 34 0	25,15,842 34 0	62,27,417 30 0
	Ahmedabad ...	...	...	58,554 0 0	30,781 0 0	1,112 0 0	31,893 0 0	90,447 0 0
	Total ...	2	2	37,70,128 36 0	25,14,320 0 0	33,415 34 0	25,47,735 34 0	63,17,864 30 0
	Surat Collectorate.							
	Dhárásna ...	1	1	95,277 0 0	2,49,350 0 0	50,939 0 0	3,00,289 0 0	3,95,566 0 0
	Thána Collectorate.							
Konkan Division.	Umbargaon ...	1	1	5,026 0 0	9,220 0 0	1,785 0 0	11,005 0 0	16,031 0 0
	Bassein ...	7	28	1,52,225 0 0	14,30,450 0 0	1,13,521 30 0	15,43,971 30 0	16,96,196 30 0
	Ghodbandar ...	9	46	2,37,916 28 0	11,66,451 0 0	97,694 2 40	12,64,148 2 40	15,02,114 25 40
	Trombay ...	4	24	1,06,052 20 0	8,55,063 0 0	76,154 10 0	9,31,217 10 0	10,37,269 30 0
	Island of Bombay—Mátunga ...	6	24	1,09,551 0 0	9,49,644 30 0	77,057 15 0	10,26,702 5 0	11,36,253 5 0
	Kolába Collectorate.							
	Panvel ...	6	19	47,459 18 0	5,52,290 0 0	34,742 20 0	5,87,032 20 0	6,34,491 38 0
	Uran ...	31	83	1,27,338 10 0	24,25,683 0 0	78,863 10 0	25,04,546 10 0	26,31,884 20 0
	Sánkse (Pen) ...	5	28	1,66,240 35 0	3,00,345 0 0	24,365 8 0	3,24,710 8 0	4,90,951 3 0
	Karanja ...	4	25	64,448 10 0	7,45,725 0 0	62,262 30 0	8,07,987 30 0	8,72,436 0 0
	Ratnágiri Collectorate.							
	Shiroda ...	1	27	18,672 21 0	1,04,177 20 0	354 29 0	1,04,532 9 0	1,23,204 30 0
	Kánara Collectorate.							
	Ankola ...	1	*129	42,628 0 0	1,11,332 0 0	5,809 20 0	1,17,141 20 0	1,59,769 20 0
	Total ...	55	434	10,77,608 17 0	86,50,384 10 0	5,72,610 14 40	92,22,994 24 40	1,03,00,603 1 40
	Grand Total ...	58	437	49,43,014 13 0	1,14,14,054 10 0	6,56,965 8 40	1,20,71,019 18 40	1,70,14,033 31 40

Divisions	Tálukas.	Sales. On payment of Full Duty.	Sales. On payment of Nominal Duty.	Sales. Free of Duty.	Sales. Total.	Amount of Excise Duty collected.	Loss and Wastage.	Total of Sales and Loss and Wastage.	Balance in hand at the close of the year.
	Ahmedabad Collectorate.	Mds. s. t.	Mds. s.	Mds. s.	Mds. s. t.	Rs. a. p.	Mds. s. t.	Mds. s. t.	Mds. s. t.
Gujarát Division.	Khárághoda ...	24,98,061 0 0	.....	1,531 20	24,99,592 20 0	36,11,535 8 0	1,89,300 29 0	26,88,893 9 0	35,38,524 21 0
	Ahmedabad ...	58,325 0 0	.....	...	58,325 0 0	87,487 8 0	461 0 0	58,786 0 0	31,661 0 0
	Total ...	25,56,386 0 0	.....	1,531 20	25,57,917 20 0	36,99,023 0 0	1,89,761 29 0	27,47,679 9 0	35,70,185 21 0
	Surat Collectorate.								
	Dhárásna ...	2,95,116 0 0	.....	...	2,95,116 0 0	4,40,952 0 0	4,426 0 0	3,99,542 0 0	96,024 0 0
	Thána Collectorate.								
Konkan Division.	Umbargaon ...	14,880 0 0	.....	...	14,880 0 0	22,320 0 0	764 0 0	15,644 0 0	367 0 0
	Bassein ...	13,80,265 30 0	.....	360 0	13,80,625 30 0	19,67,987 0 0	1,18,997 2 32	14,94,622 32 32	2,01,573 37 48
	Ghodbandar ...	10,98,123 0 0	54,026 0	...	11,52,149 0 0	16,01,815 6 6	1,01,909 5 40	12,54,058 5 40	2,48,056 20 0
	Trombay ...	8,35,480 20 0	.....	...	8,35,480 20 0	12,74,335 14 0	43,261 5 40	8,78,741 25 40	1,58,528 4 40
	Island of Bombay—Mátunga ...	9,14,713 30 0	.....	...	9,14,713 30 0	13,98,060 12 0	71,203 10 0	9,85,917 5 0	1,50,336 0 0
	Kolába Collectorate.								
	Panvel ...	4,83,205 30 0	.....	238 0	4,83,443 30 0	7,08,722 2 0	55,607 18 0	5,39,051 8 0	95,440 30 0
	Uran ...	14,38,482 0 0	6,10,252 0	27,637 0	20,76,371 0 0	23,29,521 15 6	1,18,975 20 0	21,95,346 20 0	4,36,538 0 0
	Sánkse (Pen) ...	2,58,234 30 0	23,112 0	...	2,81,336 30 0	3,91,547 6 0	36,177 13 0	3,17,514 3 0	1,73,437 0 0
	Karanja ...	1,24,213 20 0	2,79,180 0	2,160 0	4,05,553 20 0	2,08,478 4 6	19,790 20 0	4,25,344 0 0	4,47,092 0 0
	Ratnágiri Collectorate.								
	Shiroda ...	67,663 20 0	.....	...	67,663 20 0	1,01,585 4 0	8,089 30 0	75,753 10 0	47,451 20 0
	Kánara Collectorate.								
	Ankola ...	78,053 0 0	.....	9,970 0	88,023 0 0	1,17,079 8 0	9,650 0 0	97,673 0 0	62,096 20 0
	Total ...	66,93,305 20 0	9,66,570 0	40,365 0	77,00,240 20 0	1,01,15,953 8 6	5,79,425 9 32	82,79,665 29 32	20,20,937 12 8
	Grand Total ...	95,44,807 20 0	9,66,570 0	41,896 20	1,05,53,274 0 0	1,42,55,928 8 6	7,73,612 38 32	1,13,26,886 38 32	56,87,146 33 8

* Only 127 out of 129 Agars were worked during 1905-1906.

W. H. LUCAS,
Collector of Salt Revenue.

APPENDIX D.

Comparative Statement showing the quantities of Salt removed for consumption within and without the Presidency from the Sea Salt Works in British Territory, together with the distribution of Issues.

	For Export to									
	Central Provinces.		Central India.		Nizam's Territory.		Calcutta.		Madras Presidency. British Malabár.	
	1904-1905.	1905-1906.	1904-1905.	1905-1906.	1904-1905.	1905-1906.	1904-1905.	1905-1906.	1904-1905.	1905-1906
	Mds.	Mds.	Mds.	Mds.	Mds.	Mds.	Mds.	Mds.	Mds.	Mds.
Dhárasna	1,500	1,200	...	...	...	...	...	...	.....	...
Umbargaon	...	...	...	...	...	...	...	...	.....	...
Bassein, Ghodbandar, Mátunga, Trombay, Uran, Panvel, Karanja and Pen.	11,44,888	13,74,522	9,708	17,922	8,94,620	10,50,341	5,78,362	7,19,226	13,19,367	11,64,334
Shiroda	...	...	...	...	...	...	...	...	18,634	14,698
Sánikatta	...	...	...	...	...	...	...	...	90	...
Total ...	11,45,888	13,75,722	9,708	17,922	8,94,620	10,50,341	5,78,362	7,19,226	13,38,091	11,79,032

	For Export to											
	Madras Presidency—*continued.*				Foreign Malabár.		Mysore.		Within the Presidency.		Total.	
	Rest of the Presidency.		Total.									
	1904-1905.	1905-1906.	1904-1905.	1905-1906.	1904-1905.	1905-1906.	1904-1905	1905-1906.	1904-1905.	1905-1906.	1904-1905.	1905-1906.
	Mds.	Mds.	Mds.	Mds.	Mds.	Mds.	Mds.	Mds.	Mds.	Mds.	Mds.	Mds.
Dhárásna ...	...	...	...	...	...	...	...	...	3,09,975	2,93,916	3,11,475	2,95,116
Umbargaon ...	...	...	...	...	...	...	...	...	8,095	14,880	8,095	14,880
Bassein, Ghodbandar, Mátunga, Trombay, Uran, Panvel, Karanja and Pen.	1,62,579	1,80,087	14,81,946	13,44,421	8,54,010	9,66,570	3,87,630	4,21,391	17,86,351	16,35,281	71,37,015	75,29,674
Shiroda ..	...	...	18,634	14,698	...	...	...	...	62,288	52,966	80,922	67,664
Sánikatta ...	...	162	90	162	...	...	24	74	1,16,920	87,787	1,17,034	88,023
Total ...	1,62,579	1,80,249	15,00,670	13,59,281	8,54,010	9,66,570	3,87,654	4,21,465	22,83,629	20,84,830	76,54,541	79,95,357

W. H. LUCAS,
Collector of Salt Revenue.

APPENDIX

Statement showing Quantities of Foreign Salt imported by Sea

Description of Salt.	Importations by Sea.					Place of Export.
	Place of Export.	Place of Import.	Mode of Conveyance.	Quantity imported.	Amount of Import Duty levied.	
				Mds. s. t.	Rs. a. p.	
Table and packing salt, common and fine salt.	United Kingdom.	Bombay ...	Steamer ...	14,193 6 0	21,306 5 6	
Packing ...	Holland ...	Do. ...	Do. ...	82 14 0	124 12 8	
Do. ...	Belgium ...	Do. ...	Do. ...	7 26 0	11 6 11	
Do. ...	Victoria ...	Do. ...	Do. ...	9 9 0	13 13 8	
Do. ...	Hamburg ...	Do.	Do. ...	2 0 0	3 0 3	
Do. ...	Queensland	Do. ...	Do. ...	0 30 0	1 2 0	
Do. ...	Straits Settlements.	Do. ...	Do. ...	1 10 0	1 14 0	
Do. ...	Reunion ...	Do. ...	Do. ...	4 0 0	6 0 0	
Do. ...	Aden ...	Do. ...	Do. ...	15 18 0	23 3 0	
Sindha salt ...	Persia ...	Do. ...	Do. ...	3,915 0 0	5,872 8 0	
Not available ...	Ports unknown.	Do. ...	Do. ...	16 34 0	25 4 3	
Black salt ...	Káthiáwár ...	Do. ...	Country Crafts.	3,069 8 0	4,603 12 9	
Cerebas ...	Kárachi ...	Do. ...	Steamer ...	8 30 0	13 2 0	
Common salt ...	Arabia ...	Kánara District.	Country Crafts.	0 9 0	0 5 5	
Do. ...	Basrorah ...	Do. ...	Do. ...	0 34 0	1 4 5	
Black salt ...	Káthiáwár ...	Do. ...	Do. ...	0 2 40	0 1 6	
Goa salt ...	Goa ...	Do. ...	Do. ...	0 1 40	0 0 11	
			Total ...	21,326 32 0	32,008 1 3	.....
Káthiáwár salt ...	.....	.....	.....	.....	.....	Gogha ...
Goa salt ...	.....	.....	.....	.....	.....	Diggi ...
Do. ...	.....	.....	.....	.....	.....	Bánda ...
Do. ...	.....	.....	.....	.....	.....	Talevádi ...
Do. ...	.....	.....	.....	.....	.....	Kárwár ...
Do. ...	.....	.....	.....	.....	.....	Castle Rock ...
Do. ...	.....	.....	.....	.....	.....	Do. ...
Do. ...	.....	.....	.....	.....	.....	Do. ...

E.

and by Land into the Bombay Presidency during the year 1905-1906.

Importations by Land.					Total of Imports by Sea and Land.	
Place of Import.	By what Route.	Mode of Conveyance.	Quantity imported.	Amount of Import Duty levied.	Quantity imported.	Amount of Import Duty levied.
			Mds. s. t.	Rs. a. p.	Mds. s. t.	Rs. a. p.
.....	.....	.....	.....	.....	21,326 32 0	32,008 1 3
Ahmedabad District.	Bhávnagar and Gogha.	Cart-load ...	18 27 40	28 0 6		
Bombay Presidency.	Goa Frontier.	Head and bullock loads.	1,736 1 30	2,604 4 9		
Do. ...	Do. ...	Do. ...	10,408 13 40	15,612 9 4		
Do. ...	Do. ...	Do. ...	1,194 28 0	1,792 1 1		
Do. ...	Do. ...	Do. ...	4,184 21 40	6,276 6 11		
Do. ...	Do. ...	Rail ...	2,14,933 30 40	3,98,336 13 1		
Madras Presidency.	Do. ...	Do. ...	9,550 24 0			
Mysore ...	Do. ...	Do. ...	*41,073 22 0			
		Total ...	2,83,100 8 30	4,24,650 3 8	2,83,100 8 30	4,24,650 3 8
		Grand Total ...			3,04,427 0 30	4,56,658 4 11

* *N.B.*—Includes Table Salt 20 maunds and 15 seers.

W. H. LUCAS,
Collector of Salt Revenue.

APPENDIX F.

Statement showing the quantity of each description of Salt imported and delivered from Salt Works in the Bombay Presidency during the years 1904-1905 and 1905-1906.

Description of Salt.	1904-1905.		1905-1906.		Remarks.
	Quantity.	Amount realised.	Quantity.	Amount realised.	
	Mds. s. t.	Rs. a. p.	Mds. s. t.	Rs. a. p.	
Barágara Salt ...	23,15,496 20 0	46,38,444 8 0	25,57,917 20 0	36,99,023 0 0	
Sea Salt ...	79,34,917 21 39	1,37,46,737 2 5	82,78,436 14 70	1,09,81,525 4 1	
Natural Salt ...	.....	.....	.....	.....	
Sindha Salt ...	1,887 6 0	3,774 4 10	3,915 0 0	5 872 8 0	
Table Salt, Packing and Common Salt.	11,889 20 0	23,500 1 1	14,362 35 0	21,562 3 1	
Bhávnagar Black Salt (Sanchal).	2,899 3 0	5,798 2 5	3,069 10 40	4,603 14 3	
Total ...	1,02,67,089 30 39	1,84,18,254 2 9	1,08,57,701 0 30	1,47,12,586 13 5	

APPENDIX G.

Details of Issues of Salt from different sources of supply during the years 1904-1905 and 1905-1906.

	Full Duty.		Nominal Duty.		Free.		Total.	
	1904-1905.	1905-1906.	1904-1905.	1905-1906.	1904-1905.	1905-1906.	1904-1905.	1905-1906.
	Mds. s.	Mds. s.	Mds.	Mds.	Mds. s.	Mds. s.	Mds. s.	Mds. s.
Barágara Salt ...	23,13,965 0	25,56,386 0	...	...	1,531 20	1,531 20	23,15,496 20	25,57,917 20
Sea Salt ...	57,10,192 1	69,88,421 20	8,54,010	9,66,570	90,339 0	40,365 0	76,54,541 1	79,95,356 20
Imported Salt ...	2,97,052 9	3,04,427 0	...	...	...	...	2,97,052 9	3,04,427 0
Total ...	96,21,209 10	98,49,234 20	8,54,010	9,66,570	91,870 20	41,896 20	1,02,67,089 30	1,08,57,701 0

W. H. LUCAS,
Collector of Salt Revenue.

APPENDIX H.

Statement showing the average market price of Salt in each District of the Presidency during the calendar years 1902, 1903, 1904 and 1905.

District.	1902.	1903.	1904.	1905.
	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
Bombay	4 1 8	4 5 11	4 3 0	3 9 9
Ahmedabad	2 15 5	2 9 0	2 7 0	2 1 11
Kaira	3 3 2	2 10 4	2 8 0	2 2 1
Panch Mahâls	3 2 5	2 11 7	2 9 6	2 3 4
Broach	3 1 10	2 10 4	2 8 0	2 2 3
Surat	3 5 7	2 13 9	2 11 3	2 3 11
Thána	3 4 3	3 1 10	2 15 7	2 5 7
Kolába	3 4 6	3 2 3	3 5 3	2 4 9
Ratnágiri	3 3 3	3 6 3	3 0 8	2 6 8
Kánara	3 10 11	3 7 7	3 6 6	2 12 2
Násik	3 3 11	3 3 3	3 0 10	2 5 4
Khándesh	3 12 4	3 12 1	3 4 4	2 13 3
Ahmednagar	3 2 8	3 4 9	3 0 2	2 6 2
Sholápur	3 7 6	3 10 3	3 7 4	2 13 4
Poona	3 7 8	3 8 3	3 2 8	2 7 11
Sátára	3 5 3	3 8 5	3 2 6	2 10 5
Belgaum	3 11 2	3 5 0	3 2 4	2 10 3
Dhárwár	2 15 8	3 4 6	3 4 7	2 11 5
Bijápur	3 4 3	3 7 10	3 5 9	2 10 5

W. H. LUCAS,
Collector of Salt Revenue.

APPENDIX I.

Statement showing Details of Receipts and Expenditure of the Salt Department in all its Branches for the year 1905-1906, contrasted with those of the year 1904-1905.

Receipts.

Items.	1905-1906.	1904-1905.
SALT REVENUE.	Rs. a. p.	Rs. a. p.
IMPERIAL.		
Customs Duty on Salt—		
Import Duty by Sea	32,008 1 3	33,072 10 5
Do. by Land	4,24,650 3 8	5,59,125 10 1
Proceeds of Sale of Government Salt—		
Baragara Salt	4,44,475 15 5	3,53,240 14 8
Proprietary right of Government in Salt Works—		
Ground-rent at maundage rate	1,11,906 5 1	1,08,043 8 1
Ground-rent (Khárághoda and Bulsár Salt) ...	22,282 3 7	66,896 13 11
Do. (Konkan Salt Works credited to Land Revenue)	249 3 5	242 9 0
Farms of Government Salt Works	57,892 0 0	60,970 14 8
Other Salt (cost price on salt supplied to fish-curers)	18,165 10 0	34,436 9 2
Excise Duty on Government Salt—		
Do. on Permits issued	1,42,41,342 8 0	1,78,12,262 8 0
Do. at nominal rates	14,586 0 6	13,793 6 3
Single and double duty (on excesses discovered on examination and by weighment at place of Import)	2,709 6 4	3,230 10 1
Total, Imperial ...	1,53,70,267 9 3	1,90,45,316 2 4
PROVINCIAL.		
Fines and Forfeitures	1,340 5 6	1,565 12 10
Miscellaneous—		
Overtime Work Fees	19,982 4 0	14,725 10 0
Contribution from Port Funds towards cost of Coast-guard Establishment	10,000 0 0	10,000 0 0
Cost of Establishment recovered from Salt-farmers	2,593 15 2	2,614 8 8
Recovery of Salt Agents' Bagging and Sewing charges	74,979 8 4	82,356 8 9
Recovery of clothing charges	13,060 7 3	13,090 2 1
Other Items	4,423 4 7	3,194 5 7
Sale-proceeds of forms, &c. (credited to XXIII —Stationery and Printing)	438 4 3	390 13 3
Total, Provincial ...	1,26,818 1 1	1,27,937 13 2
Grand Total, Salt Revenue ...	1,54,97,085 10 4	1,91,73,253 15 6

	Rs. a. p.
Total Decrease ...	36,76,168 5 2

APPENDIX I—*continued.*

Expenditure.

Items.	1905-1906. Rs. a. p	1904-1905. Rs. a. p.
SALT, IMPERIAL.		
Superior Supervising Establishment—		
Pay, including Exchange Compensation ...	1,27,292 3 9	1,84,426 9 2
Travelling Allowance	13,882 7 2	13,649 3 0
Tentage	1,991 12 5	2,000 1 9
Subordinate Establishment—		
Pay, including Exchange Compensation Allowance	9,87,146 3 6	9,80,229 14 7
Travelling Allowance	38,882 6 10	39,718 13 6
House Rent Allowance	92 12 5	92 1 1
Horse Allowances	7,368 9 11	7,987 12 0
Grain Compensation	2,383 13 7	.....
Contingencies—		
Epidemic Charges	.....	583 13 4
Service Stamps and Bearing Postage	7,918 15 0	8,479 14 0
Telegram Charges	340 5 0	302 10 0
Repairs to Boundary marks	.....	5 4 0
Law Charges	143 2 0	329 8 6
Purchase of Books	440 8 0	31 0 0
Purchase of Tents	.....	538 12 0
Do. of Land and Compensation for Land	42 10 0	326 12 0
Re-alignment of the Daman Frontier	.....	73 11 9
Purchase of New Boats	1,945 7 0	1,900 0 0
Rents	8,825 4 0	8,733 3 10
Rates and Taxes	1,067 15 9	1,410 0 5
Prizes for best Salt manufactured at Khárághoda	600 0 0	600 0 0
Clothing to Lascars	1,095 0 0	1,568 0 0
Boat Stores and Repairs	31,242 5 4	36,322 9 10
Rewards in Salt and Customs cases	3,956 7 7	6,878 6 1
Petty construction	58,290 14 10	72,268 8 10
Peons' clothing (Táluka Offices)	59,436 10 3	30,395 1 11
Arms and Accoutrements	2,928 13 6	1,768 11 9
Boat Allowance	14,671 1 3	14,500 0 11
Overtime Work Fees	19,465 12 3	14,600 14 0
Salt Purchase and Freight on account of Barágara Salt	3,24,416 13 7	3,06,486 3 8
Do. of removal of Salt to Fish-curing Yards	6,707 4 10	18,508 5 2
Khárághoda Dispensary Charges	502 13 7	705 5 1
Commission on Sale of Barágara Salt	1,318 10 5	9,393 13 2
Salt Agents' Bagging and Sewing Charges ...	85,861 9 3	59,998 10 3
Scales and Weights	2,255 9 7	3,023 4 11
Mapping charges	2 6 0	38 6 6
Supply of Medicines	623 4 11	660 15 0
Carriage of Tents and Records	2,599 13 4	2,126 10 0
Supply of Water	2,346 15 2	1,444 14 1
Peons' Uniforms and Belts (Huzúr Offices) ...	360 0 0	211 8 3
Petty Repairs	10,556 14 0	10,208 6 11
Petty Supply	5,345 13 4	5,579 9 4
Purchase of Carpets	574 14 4	1,224 2 1
Purchase of furniture	1,209 15 4	2,502 8 11
Repairs of furniture	7 10 6	44 7 6
Remittance of Treasure	267 0 7	270 14 10
Conveyance of Confiscated Salt, &c.	82 4 6	109 6 3
Monsoon Weather Fences	8,202 11 4	7,550 13 9
Carried forward ...	18,44,694 1 11	18,09,809 11 11

APPENDIX I—*concluded.*

Expenditure—*continued.*

Items.	1905-1906.	1904-1905.
	Rs. a. p.	Rs. a. p.
Brought over ...	18,44,694 1 11	18,09,809 11 11
SALT, IMPERIAL—*continued.*		
Contingencies—*continued.*		
Gám Kharach Allowance	757 15 9	722 6 3
Destruction of Salt	3 0 0	242 5 2
Miscellaneous	604 6 9	617 11 11
Total, Salt ...	18,46,059 8 5	18,11,392 3 3
Deduct amount debitable to "4 Opium" as per Government Resolution, Revenue Department, No. 6639 of 17th August 1905	345 0 0	.....
Net amount	18,45,714 8 5	18,11,392 3 3
Deduct amount not subject to division	3,72,090 4 5	3,65,934 6 2
Net amount	14,73,624 4 0	14,45,457 13 1
Deduct one-tenth debitable to Customs	1,47,362 6 10	1,44,545 12 6
Net nine-tenths debitable to Salt	13,26,261 13 2	13,00,912 0 7
Net debitable to Salt	16,98,352 1 7	16,66,846 6 9
Stationery and Printing	9,445 1 5	9,061 5 5
Excise duty on Salt refunded	65,530 11 9	62,496 1 2
GRAND TOTAL, SALT EXPENDITURE ...	17,73,327 14 9	17,38,403 13 4
	Net Increase ...	34,924 1 5

APPENDIX J.

Statement showing Transactions, Credit and Cash, during the past three years.

	1903-1904.		1904-1905.		1905-1906.	
	Quantity.	Duty realizations.	Quantity.	Duty realizations.	Quantity.	Duty realizations.
1. Quantity issued and duty recovered in cash during the year	Mds. s. t. 74,55,444 1 40	Rs. a. p. 1,49,13,046 9 0	Mds. s. t. 84,72,988 38 0	Rs. a. p. 1,68,03,413 2 5	Mds. s. t. 89,20,927 23 27	Rs. a. p. 1,33,81,391 6 0
2. Quantity issued on credit bonds during the year, but the duty on which remained to be recovered in the next year	2,97,691 30 0	.....	3,07,431 15 0	.....	3,55,270 20 0	.....
3. Quantity remaining unissued at the end of the preceding year and issued in the year, duty on which at Rs. 2-8-0, Rs. 2-0-0 and Rs. 1-8-0 was realized and accounted for in that year.	1,78,988 32 0	.....	2,43,756 28 0	.....	2,68,608 16 53	.....
4. Duty on quantity issued on credit bonds in the preceding year recovered in the year	.....	13,96,957 12 0	.....	6,45,304 1 7	.....	5,62,749 4 0
5. Duty realized in the year, but quantity not issued until after expiry of the year	.....	4,85,412 3 7	.....	3,55,393 10 0	.....	2,94,672 4 0
6. Duty realized for salt remaining unissued on credit bonds, duty at Rs. 2-0-0, and Rs. 1-8-0 having been realized in the year before issue	.....	1,619 8 0	.....	8,092 10 0	.....	2,529 10 0
Total ...	79,32,124 23 40	1,67,96,036 0 7	90,24,157 1 0	1,78,12,202 8 0	95,44,807 20 0	1,42,41,342 8 0

W. H. LUCAS,
Collector of Salt Revenue.

APPENDIX K.

Statement showing the operations of the Fish-curing Yards in the Bombay Presidency for the year 1905-1906.

No.	Name of Yard.	Year.	Quantity of Fish brought to be cured.	Quantity of Salt issued.	Quantity of Fish removed.	Percentage of Fish to each maund of Salt.	Expenditure including cost of construction, removal, &c., of Yards.	Receipts. Amount realized by sale of Salt at 8 annas per maund.	Receipts. Miscellaneous receipts.	Receipts. Stock of Salt at the close of the year.	Receipts. Value of Salt in Stock at the close of the year at cost price.	Receipts. Total.
	Ratnágiri Range.		Mds. s.	Mds. s.	Mds. s.		Rs. a. p.	Rs. a. p.	Rs. a. p.	Mds. s. t.	Rs. a. p.	Rs. a. p.
1	Jaygad	1905-1906	7,531 5	2,733 20	5,805 0	2·76	1,341 11 8	1,366 12 0	.....	447 37 0	115 7 7	1,482 3 7
		1904-1905	8,878 15	3,103 0	6,769 11	2·81	1,661 7 2	1,581 8 0	.....	1,225 33 0	270 3 3	1,851 10 3
2	Waroda	1905-1906	650 10	217 0	503 20	2·99	432 10 3	108 8 0	0 12 0	501 28 0	135 14 0	245 2 0
		1904-1905	637 10	171 20	413 30	3·13	449 8 2	85 12 0	0 7 0	718 26 0	195 4 6	281 7 6
3	Kalbadevi	1905-1906	2,529 0	842 0	1,890 30	3·0	1,016 0 8	421 0 0	0 5 0	515 0 0	108 1 9	529 6 9
		1904-1905	3,389 20	1,129 0	2,542 5	3·0	853 6 0	564 8 0	.....	494 29 0	110 2 3	674 10 3
4	Ratnágiri	1905-1906	18,342 20	6,113 20	13,679 20	3·0	2,206 12 4	3,058 12 0	6 0 0	1,611 3 0	302 3 5	3,454 15 5
		1904-1905	18,772 35	6,221 25	14,611 20	3·02	2,187 12 1	3,110 13 0	6 0 0	1,227 20 0	282 15 2	3,390 12 2
5	Purnagad	1905-1906	1,031 0	346 0	847 20	2·98	496 15 8	173 0 0	1 13 0	1,064 8 0	227 3 4	402 0 4
		1904-1905	1,716 20	633 0	1,336 15	2·71	676 6 0	316 8 0	0 8 0	1,410 8 0	299 9 8	616 9 8
6	Jaitápur	1905-1906	3,629 19	1,270 10	2,912 36	3·0	943 8 7	638 2 0	2 1 3	1,358 20 0	254 11 6	894 14 9
		1904-1905	5,571 5	1,868 0	4,181 25	2·98	1,246 15 8	934 0 0	3 1 0	1,523 35 0	330 14 8	1,267 15 8
7	Vijiádurg	1905-1906	3,663 20	1,219 0	2,747 25	3·05	1,008 5 8	609 8 0	0 13 3	1,264 2 0	223 13 5	834 2 8
		1904-1905	5,149 15	1,778 30	3,864 31	2·89	1,501 6 2	889 6 0	0 7 0	2,536 12 0	571 0 5	1,460 13 5
8	Devgad (Mumbri)	1905-1906	588 0	196 0	445 0	3·0	547 5 7	98 0 0	.....	593 8 0	133 5 4	231 5 4
		1904-1905	1,782 0	594 10	1,366 25	2·99	652 14 10	297 2 0	.....	789 8 0	177 6 3	474 8 3
9	Málvan	1905-1906	12,318 5	3,725 10	9,220 25	3·31	2,340 10 4	1,863 10 0	0 12 0	5,508 30 0	1,260 3 0	3,123 0 0
		1904-1905	21,176 17½	6,676 30	15,781 13½	3·17	3,318 9 9	3,338 0 0	3 2 0	4,890 33 0	1,283 8 5	4,625 5 0
10	Devbág	1905-1906	9,754 20	3,170 20	8,001 0	3·08	2,043 13 8	1,585 4 0	1 8 0	2,010 7 0	454 8 8	2,240 15 8
		1904-1905	21,060 15	6,586 20	17,502 30	3·06	2,746 0 3	3,443 4 0	1 0 0	3,310 6 40	773 1 11	4,217 5 11
11	Achra	1905-1906	716 20	239 20	539 5	3·0	347 8 3	119 12 0	.....	636 18 0	153 9 3	273 5 3
		1904-1906	1,721 10	573 30	1,233 7½	3·0	485 1 2	286 14 0	.....	975 38 0	211 5 11	498 3 11
12	Nivti	1905-1906	2,058 0	588 0	1,545 20	3·5	511 10 9	294 0 0	.....	972 26 0	170 9 11	464 9 11
		1904-1905	4,173 20	1,318 0	3,160 20	3·17	673 6 10	659 0 0	.....	277 8 0	106 1 7	765 1 7
13	Vengurla	1905-1906	4,381 0	1,617 0	3,684 0	3·02	1,683 15 7	808 8 0	4 0 0	3,107 29 0	649 6 6	1,461 14 6
		1904-1905	33,612 10	11,091 10	25,536 10	3·03	3,713 3 3	5,545 10 0	2 4 0	3,786 3 0	990 2 6	6,538 0 6
14	Shiroda	1905-1906	455 30	141 30	379 35	3·22	595 1 2	70 14 0	.....	1,057 21 0	197 12 3	268 10 3
		1904-1905	9,655 35	3,095 31	7,986 35	3·12	1,151 7 10	1,547 14 2	.....	1,109 11 0	324 7 4	1,872 5 6
	Total of the Ratnágiri Range.	1905-1906	68,349 29	22,425 10	52,201 36	3·05	15,516 2 2	11,212 10 0	18 0 6	21,698 37 0	4,676 9 8	15,907 4 2
		1904-1905	1,37,191 27½	45,201 6	1,06,346 39	3·04	21,324 9 2	22,600 9 2	18 13 0	24,205 32 40	5,946 2 10	28,543 9 0
	Kánara Range.											
15	Majali	1905-1906	6,032 25	1,813 0	6,404 32	3·76	1,047 4 5	921 8 0	.....	2,132 1 40	475 5 6	1,396 13 6
		1904-1905	14,752 20	3,539 20	11,696 30	4·17	1,078 6 5	1,769 12 0	.....	1,702 32 40	414 7 2	2,184 3 2
16	Bathkhole	1905-1906	1,373 12	360 0	958 21	3·81	838 2 8	180 0 0	.....	1,970 10 0	397 6 9	577 6 8
		1904-1905	22,337 25	6,735 0	15,093 7	3·32	2,347 5 2	3,367 8 0	.....	2,331 0 0	501 0 5	3,868 8 5
17	Bingi	1905-1906	678 10	171 20	577 20	3·95	72 11 5	85 12 0	.....	121 25 0	28 14 9	112 10 2
		1904-1905	1,549 20	395 0	1,518 30	3·92	170 6 4	197 8 0	.....	203 5 0	62 10 5	260 2 5
18	Chendia	1905-1906	2,558 0	738 20	1,951 35	3·45	538 11 2	360 4 0	.....	1,087 2 0	228 7 0	597 8 0
		1904-1905	6,258 20	2,001 0	4,787 20	3·13	869 15 6	1,000 8 0	.....	1,235 1 0	272 7 10	1,272 15 10
19	Kodar	1905-1906	10,950 20	3,551 20	7,628 23	3·09	1,310 15 8	1,775 12 0	.....	556 33 0	123 10 0	1,899 6 0
		1904-1905	1,947 35	609 0	1,417 5	3·20	793 3 5	304 8 0	.....	435 36 24	116 10 3	421 2 3
20	Harwada	1905-1906	3,394 25	866 0	2,684 6	3·92	453 4 0	433 0 0	1 4 0	640 11 0	113 1 5	547 5 5
		1904-1905	9,314 25	2,091 20	6,597 10	4·47	1,313 12 6	1,040 12 0	.....	1,257 9 0	278 3 6	1,318 15 6
21	Keni	1905-1906	2,140 20	502 0	1,737 30	3·81	507 8 8	251 0 0	.....	1,126 4 0	262 9 6	513 9 6
		1904-1905	4,038 30	1,008 0	3,421 5	4·01	871 7 8	504 0 0	4 9 3	1,698 4 0	385 5 10	893 14 1
22	Gangawali	1905-1906	723 5	184 0	567 35	3·93	541 13 3	92 0 0	.....	1,635 32 0	376 12 7	468 12 7
		1904-1905	2,236 20	549 20	1,827 37	4·07	817 6 6	274 12 0	.....	1,842 34 0	427 10 3	702 6 3
23	Tadri	1905-1906	902 24	285 20	749 0	3·19	302 2 7	92 12 0	0 2 0	283 6 5	53 4 10	146 2 10
		1904-1905	1,609 35	324 20	1,351 20	4·96	425 10 1	162 4 0	4 9 0	260 18 5	52 15 7	219 12 7
24	Kumta	1905-1906	2,618 2	582 20	2,059 9	4·49	689 4 8	291 4 0	0 5 0	233 32 0	48 5 10	339 14 10
		1904-1905	4,714 32	1,080 20	3,654 17	4·36	900 8 7	540 4 0	2 8 0	310 4 20	77 4 3	620 0 3
25	Kasarkode	1905-1906	17,636 38	3,920 0	13,864 2	4·63	1,292 9 0	1,910 0 0	.....	178 29 0	35 10 4	1,945 10 4
		1904-1905	17,127 0	4,293 20	13,607 20	3·98	2,030 4 6	2,149 4 0	.....	2,762 8 0	649 0 8	2,798 4 9
26	Manki	1905-1906	1,757 20	439 0	1,518 20	4·0	253 13 10	219 8 0	0 1 6	152 29 0	32 14 10	252 8 4
		1904-1905	1,000 20	278 0	1,486 18	5·76	197 11 6	139 0 0	.....	147 3 0	31 0 6	170 0 6
27	Murdeshwar	1905-1906	1,591 20	452 0	1,223 30	3·52	372 3 5	226 0 0	.....	466 39 40	113 4 2	339 4 2
		1904-1905	483 0	88 20	406 5	5·51	227 5 0	44 4 0	.....	431 11 40	107 10 3	151 14 3
28	Shirali	1905-1906	213 31	31 20	177 3	6·79	188 12 9	15 13 0	.....	141 6 0	31 11 5	47 7 5
		1904-1905	1,242 25	151 20	990 37	8·20	166 6 7	75 12 0	.....	172 26 0	40 11 9	116 7 9
29	Bhatkal	1905-1906	622 2	119 0	530 18½	5·23	194 2 0	59 8 0	.....	248 16 0	61 1 5	120 9 5
		1904-1905	2,537 0	532 0	1,961 5	4·77	293 10 2	266 0 0	.....	97 18 0	24 9 6	290 0 6
	Total of the Kánara Range.	1905-1906	54,161 14	13,906 0	42,723 4½	3·89	8,603 7 6	6,953 0 0	1 12 0	9,983 37 5	2,330 2 4	9,284 14 10
		1904-1905	91,755 27	23,673 0	69,727 26	3·88	13,133 7 6	11,836 0 0	11 10 8	15,032 10 49	3,442 2 3	15,289 12 6
	Grand Total	1905-1906	1,22,512 3	36,331 10	94,925 ¼	3·3	24,119 9 8	18,165 10 0	19 13 0	31,682 24 5	7,006 12 0	25,242 3 0
		1904-1905	2,28,947 14½	68,873 6	1,76,074 24	3·3	34,458 9 8	34,436 9 2	28 7 3	39,237 43 9	9,388 5 1	43,853 5 6

		Rs. a. p.
Receipts	...	25,242 3 0
Expenditure	...	24,119 9 8
Profit	...	1,122 9 4

W. H. LUCAS,
Collector of Salt Revenue.

APPENDIX L.

Statement showing Details of Cases of Salt smuggling disposed of by the Salt Department during the year 1905-1906.

SALT.

Divisions.	Nature of Offence.										Mode of Smuggling.							
	Theft from Salt-works.		Smuggling foreign Salt across Frontier.		Clandestine removal of Natural Salt.		Removals from Salt-works in excess of quantities specified in Permits.		Miscellaneous.		Total.		By Head-loads.		On Animals.		In Carts.		By Boats.	
	No.	Quantity.	No.	Quantity.	No.	Quantity.	No.	Quantity.	No.	Quantity.	No.	Quantity.	No.	Quantity.	No.	Quantity.	No.	Quantity.	No.	Quantity.
		Mds. s. t.		Mds. s. t.		Mds. s. t.		Mds. s. t.		Mds. s. t.		Mds. s. t.		Mds. s. t.		Mds. s. t.		Mds. s. t.		Mds. s. t.
Northern Division.	1	0 0 1½	1	0 10 40	106	17 0 32½	...	...	1	0 1 30	109	17 12 24	76	12 31 2½	...	...	...	...	1	0 10 40
Daman Frontier..	...	...	23	31 31 78	...	...	...	...	...	...	23	31 31 78	6	29 14 0	...	...	1	0 0 17	...	...
Total, N. D. and Daman ...	1	0 0 1½	24	32 2 38	106	17 0 32½	...	...	1	0 1 30	132	49 4 22	76	42 5 2½	...	...	1	0 0 17	1	0 10 40
Southern Division.	25	37 28 2	3	1 26 27	203	88 6 24	...	...	273	233 34 19	504	721 14 72	35	41 29 2	...	...	5	32 22 40	14	21 36 33
Goa Territory ...	....	...	156	105 16 25½	...	...	...	...	12	3 36 61½	168	199 13 7	99	164 4 45	...	...	...	...	...	...
Total, S. D. and Goa ...	25	37 28 2	159	197 2 52½	203	88 6 24	...	...	285	237 31 ½	672	920 27 79	131	205 33 47	...	...	5	32 22 40	14	21 36 33
Total ...	26	37 28 3½	183	229 5 10½	309	105 6 56½	...	...	286	237 32 30½	804	969 32 21	207	247 38 49½	...	...	6	32 23 57	15	22 6 73

SALT—*contd.*

Divisions.	Mode of Smuggling—*contd.*				How cases were disposed of.						Total estimated value of Confiscations.	Fine in lieu of confiscated Property released.	Actual produce by auction-sale of confiscated Property.	Total of two previous columns.	Fines imposed by Magistrates.	Real value of confiscated Property.	Rewards granted, if any.
	Miscellaneous.		Total.		Number of persons arrested.	Number of persons released by the Department.	Number of persons prosecuted.	Number of persons convicted.	Number of persons acquitted	Percentage of convictions on number prosecuted.							
	No.	Quantity.	No.	Quantity.							Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
		Mds. s. t.		Mds. s. t.													
Northern Division.	38	4 10 61½	109	17 12 24	111	4	107	90	17	84·1	4,714 12 2	12 0 0	1 0 9	13 0 9	258 8 0	4,706 13 10	239 0 0
Daman Frontier..	16	2 17 61	23	31 31 78	23	1	22	22	...	100·	147 5 3	.....	.....	.....	55 0 0	147 5 3	140 0 0
Total, N. D. and Daman ...	54	6 28 42½	132	49 4 22	134	5	129	112	17	86·	4,862 1 5	12 0 0	1 0 9	13 0 9	313 8 0	4,854 3 1	379 0 0
Southern Division.	450	265 6 77	504	361 14 72	575	27	548	537	11	97·9	5,304 4 6	200 4 6	125 13 8	326 2 2	1,506 13 0	4,764 3 0	1,511 13 0
Goa Territory ...	72	35 8 42	168	199 13 7	184	17	167	163	4	97·6	446 8 3	.....	11 15 7	11 15 7	318 8 0	431 3 7	533 13 0
Total, S. D. and Goa ...	522	300 15 39	672	560 27 79	759	44	715	700	15	97·9	5,750 7 9	200 4 6	137 13 8	338 1 9	1,824 5 0	5,195 6 1	2,045 13 0
Total ...	576	307 4 1½	804	609 32 21	893	49	844	812	32	98·2	10,612 9 2	212 4 6	138 14 0	351 2 6	2,137 13 0	10,049 9 2	2,424 13 0

W. H. LUCAS,
Collector of Salt Revenue.

COMMISSIONER'S REVIEW.

No. 4508 OF 1906.

Camp Poona, 13th August 1906.

Submitted to Government in the Revenue Department.

2. The financial results of the year under review, as contrasted with those of the preceding years, are given in the subjoined table :— Financial results.

	1905-06.	1904-05.	1903-04.	Annual average. 1898—1903.
	Rs.	Rs.	Rs.	Rs.
Gross receipts	155 lákhs.	192 lákhs.	180 lákhs.	226 lákhs.
Net receipts	137 „	174 „	163 „	210 „
Expenditure exclusive of refunds	17·08 „	16·76 „	16·57 „	15·99 „
Percentage of charges to net receipts	12·5 „	9·6 „	10·1 „	7·6 „

It will be seen that the net receipts decreased by 37 lákhs. The decrease was chiefly under Excise duty on salt owing to the reduction of that duty from Rs. 2 to Re. 1-8 per maund. Receipts.

There was an increase of Rs. 31,890 in the expenditure which is mainly attributable to two causes: (1) the supply of the first year's clothing to the menial establishment on the Northern Frontier and in the Presidency Division, and (2) the payment of the previous year's arrears on account of "Salt agents' bagging and sewing charges". Expenditure.

3. The following table shows the opening and the closing balances and the results of the year's operations as compared with those of the previous years :— Manufacture and removal of salt.

Year.		Stock in hand at the beginning of the year.	Brought to account during the year.	Removals.	Loss and wastage.	Balance in hand at the close of the year.
		Mds.	Mds.	Mds.	Mds.	Mds.
1904-05	Barágra ...	41,63,204	21,50,882	23,15,496	2,28,461	37,70,129
	Bulsár ...	1,06,084	3,38,613	3,11,475	37,945	95,277
	Rest of the Presidency ...	98,927	87,94,418	73,43,066	4,72,670	10,77,608
	Total ...	43,68,215	1,12,83,913	99,70,037	7,39,076	49,43,014
1905-06	Barágra ...	37,70,129	25,47,736	25,57,917	1,89,762	35,70,186
	Bulsár ...	95,277	3,00,289	2,95,116	4,426	96,024
	Rest of the Presidency ...	10,77,608	92,22,995	77,00,241	5,79,425	20,20,937
	Total ...	49,43,014	1,20,71,020	1,05,53,274	7,73,613	56,87,147

4. The stock of Barágra salt at the beginning of the year was less by nearly four lákhs of maunds than in the beginning of the previous year, but the quantity of salt manufactured and brought to account during the year under review was more by the same quantity (four lákhs) than in the previous year. The increase was due to the lateness of the rains. The stock at the close of the year was 35,70,186 maunds against 37,70,129 maunds at the close of the previous year. If 23,54,499 maunds manufactured during the manufacturing season of Stocks of salt, Barágra.

1905-06 and brought to account after the close of the year be added to it, the total stock will amount to 59,24,685 maunds, showing a decrease of nearly 4 lákhs of maunds from the previous year's figures. This noticeable decrease was due to the heavy and unseasonable rainfall in February last, which not only destroyed 20 per cent. of the salt, but also weakened the productive capacity of the pans. To make up this deficiency the Collector of Salt Revenue has arranged to have 25 new pans opened during the coming season.

Sea-salt.

5. The considerable increases in the quantity manufactured during the year under review and the balance in hand at the close of the year as contrasted with the figures of the previous year are due to the favourable manufacturing season.

Issues of Barágra salt.

6. The removals of Barágra salt show a substantial increase of nearly two and a half lákhs of maunds over last year's figures, which can be attributed only to the reduction of eight annas in the rate of salt duty. An increase occurs in the case of almost all the districts, agencies and territory (the Gaikwar's) to which Barágra salt is issued for local consumption and in the case of all the territories to which that salt is exported, the most noticeable increments being in the exports to the United Provinces of Agra and Oudh, and to Central India including Málwa and Rájputána. The throwing open of the trade in Barágra salt to private enterprise in accordance with Government Resolution, Revenue Department, No. 2582, dated the 28th March 1905, has not so far had any great effect. The sales by agencies rose from four to nearly four and a quarter lákhs of maunds, whereas those by private traders in places within the Presidency, where the agents had hitherto enjoyed a monopoly, amounted to only 17,000 maunds. As yet it does not appear that private traders can compete successfully with the agents; whether ultimately they will be able to do experience alone can show.

Issues of sea salt.

7. In the total removals of sea-salt there is an increase of nearly three and a half lákhs of maunds over the previous year's figures, to which all the places without the Presidency contribute, except British Malabár. In the case of Travancore and Cochin the increase amounts to over a lákh of maunds. The removals to places within the Presidency, however, show a decrease of nearly two lákhs of maunds, but the deficiency has been partially made up by Barágra and foreign salt. The general increase is attributable mostly to the effect of the reduction of duty.

Imported salt.

8. Imported foreign salt shows a small increase of 7,375 maunds, which is chiefly shared by Goa and Liverpool salt. The traffic in Bombay salt *vid* Castle Rock has altogether ceased owing to the reduction in the rates of railway freight from Bombay *vid* Poona.

Consumption and the influence of reduction of duty upon prices and consumption.

9. The average consumption of salt per head of population in the whole Presidency was 11·05 lbs. against 11·68 lbs. in the previous year. This decrease in consumption, notwithstanding the reduction of the salt duty from Rs. 2 to Re. 1-8-0, and the decline in the market price of salt in all districts, can be attributed only to the unfavourable season. While in Gujarát there was an increase of ·05 lb. per head, the rest of the Presidency shows a decrease of ·90 lb. It can hardly be doubted that had the season been favourable, there would have been a greater increase in Gujarát and an appreciable increase in place of a decrease in the Deccan and Southern Marátha Country. It is also to be borne in mind that, as was pointed out in the Commissioner's Review last year, the issues of the year do not afford a true measure of the consumption of the year; and that in the year under report the persistent rumours that there would be a further reduction in duty in honour of the visit to India of their Royal Highnesses the Prince and Princess of Wales caused a heavy decrease in issues towards the close of the year. The Commissioner has reported separately in his No. 6695, dated the 15th November 1905, on the question how far the consumer has benefited by the reduction in duty; and it seems unnecessary to say more on the present occasion than that the apparent decrease in consumption being accounted for by other causes, there is no reason to doubt that consumption is effectively stimulated by the further reduction in duty, which has the additional incidental advantage of rendering smuggling unprofitable and leading consequently to a distinct decrease in the prosecutions for that offence.

10. The loss and wastage of Barágra salt amounted to 1,89,762 maunds against 2,28,460 maunds in the previous year, but there was an increase of nearly ¾ths of a lákh of maunds in loss and wastage of sea-salt, which, if compared with the quantity produced, cannot be said to be heavy. Loss and wastage.

11. The number of fish-curing yards remained the same as in the previous year, but the transactions show a large decrease owing to the very unfavourable fishing season. The quantity of fish brought to be cured fell from 2,28,947 maunds to 1,22,512 maunds and that removed from 1,76,074 maunds to 94,925 maunds. There was nevertheless a small net profit of Rs. 1,122-9-4 as against Rs. 9,375-4-10 in the previous year. Fish-curing yards.

12. The total number of cases detected decreased by 36·1 per cent., the number being 804 against 1,259 in the previous year. The decrease was noticeable chiefly in cases of clandestine removal of natural salt in the Southern Division. The general decrease may be ascribed to the effect of the reduction of duty which has rendered smuggling of salt far less profitable and to the effective supervision of the Frontier Preventive force. Offences.

13. The question regarding the supply of salt to the Travancore and Cochin States in sealed and specially marked bags has not yet been finally settled. The scheme for the opening of a new set of saltworks at Bhándup has been sanctioned by Government in their Resolution, Revenue Department, No. 6362, dated the 3rd July 1906, but the question of the construction of sidings by the Great Indian Peninsula Railway Company is still pending. Supply of salt to Travancore and Cochin States and the proposed opening of new saltworks.

14. The administration of the Department during the year has been successful. The Commissioner believes that the commendations bestowed by the Collector on the officers mentioned by him for their good work are well deserved. Mr. Lucas was in charge of the Department throughout the year and the Commissioner understands from notes left by the Hon'ble Mr. Jenkins that he has exhibited marked energy and administrative ability. Concluding remarks.

R. A. LAMB,
Commissioner of Customs,
Salt, Opium and Abkári.

REPORT

ON THE

ADMINISTRATION

OF THE

SALT DEPARTMENT OF THE BOMBAY PRESIDENCY

FOR THE

OFFICIAL YEAR 1911-1912,

WITH

APPENDICES.

BOMBAY
PRINTED AT THE GOVERNMENT CENTRAL PRESS
1912

No. 5041 OF 1912.

From

W. C. SHEPHERD, ESQUIRE, B.A., I. C. S.,
Collector of Salt Revenue,
Bombay;

To

H. O. QUIN, ESQUIRE, I. C. S.,
Commissioner of Customs, Salt, Opium and Abkári,
Bombay.

Poona, 11th July 1912.

Sir,

INTRODUCTORY.

I have the honour to submit the annual report on the Administration of the Salt Department for the financial year 1911-12.

Collector's office.

2. Mr. E. G. L. Laird-MacGregor, B.A., I. C. S., was in charge of the Department till 26th April 1911, when he was succeeded by Mr. R. E. Enthoven, C.I.E., I. C. S., who remained in charge of the Department till his transfer under the Government of India as Secretary of the Department of Commerce and Industry on 23rd December 1911. Mr. MacGregor held charge in addition to his own duties as Provincial Superintendent of Census from 23rd December 1911 to 2nd January 1912, when he was relieved by Mr. C. N. Seddon, I. C. S.; Mr. Seddon having proceeded on leave on 22nd January 1912, I succeeded him and held charge of the Department till the end of the year.

Supervising staff.

3. The Supervising staff consisted throughout the year, as before, of one Collector, ten Assistant Collectors and one Native Assistant.

Strength of the Department.

4. During the year under report the following changes were made in the subordinate establishment :—

(*a*) Under telegraphic sanction conveyed by Government of India on 29th September 1911 the pay of the menial establishment of the Department (except on the Northern Frontier) was revised from 1st October 1911 as detailed below :—

(I) The pay of the Naiks was raised from Rs. 12 to Rs. 13, of the peons from Rs. 10, 9 and 8 to Rs. 11, 10 and 9, and of the farashes from Rs. 5 and Rs. 7 to Rs. 8.

(II) The undermentioned sixteen new appointments were created :—

(1) Eight peons to guard the new Madhavprasad salt-work and the extended portions of the Sarwai and the Wanarasi salt-works in the Bassein Táluka.

(2) Three 12-monthly peons and one 9-monthly peon for the newly opened Fish-Curing Yards at Mithbao and Sarjekot in the Ratnágiri District.

(3) Four 9-monthly peons for guarding purposes in the Kánara Range.

(*b*) Under Commissioner of Customs, Salt, Opium and Abkári's No. 6806, dated the 30th September 1911, an armourer's post on Rs. 35 per mensem was created for repairing scales at the Coast Guard Dockyard.

(*c*) Under Commissioner of Customs, Salt, Opium and Abkári's No. 7419, dated the 26th October 1911, the posts of two peons on Rs. 11 each employed for destroying natural formations of salt in the Jath State were abolished with effect from 1st December 1911, and the duties performed by the peons were entrusted to the Excise establishment.

(*d*) Under Government Resolution, Revenue Department, No. 10004, dated the 26th October 1911, the following establishment has been temporarily abolished owing to the closing of the Salt Depôt at Ahmedabad :—

		Rs.	a.	p.	
1 Superintendent	... ...	100	0	0	
1 Clerk	... ...	35	0	0	
1 Do.	... ...	25	0	0	
1 Naik	... ...	12	9	6	
2 Peons	... ...	10	10	6	each.
2 Do.	... ...	9	11	0	each.
2 Do.	... ...	8	11	6	each.

Summary of constitution and operations of the Department.

5. A summary of the constitution and operations of the Department as a whole is subjoined, the corresponding figures for 1910-11 being given for the purpose of comparison :—

	1910-11.	1911-12.	Increase.	Decrease.
1. Number of supervising officers.	12	12	.....	.....
2. Number of subordinate establishment	5,887	5,892	5	.....
3. Number of tálukas ...	39	39	.....	.....
4. Number of salt-works ...	434	433	.....	1
5. Number of maunds of salt excised and imported by sea and land on payment of duty	1,15,04,460	1,21,63,018	6,58,558	.....
6. Number of maunds of salt delivered free and at nominal rate of duty	9,87,490	8,46,753	.....	1,40,737
7. Total number of maunds of salt excised imported, delivered free, or at nominal duty	1,24,91,950	1,30,09,771	5,17,821	.....
8. Total revenue ... Rs.	1,22,97,871	1,33,15,701	10,17,830	.....
9. Number of offences enquired into	135	105	.....	30

6. The financial results of the last year's administration, compared with those of the preceding four years, are exhibited below :—

Year.	Gross Receipts.	Expenditure.	Refunds.	Total of Expenditure and Refunds.	Net Receipts.	Percentage Charges on Gross Receipts.
	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
1907-1908 ...	1,19,77,326 15 10	18,00,934 0 2	48,797 7 8	18,49,731 7 10	1,01,27,595 8 0	15 7 1
1908-1909 ...	1,22,02,025 2 4	18,24,239 8 1	39,852 0 2	18,64,091 8 3	1,03,37,933 10 1	15 4 5
1909-1910 ...	1,26,11,100 7 8	18,75,526 7 1	47,089 6 0	19,22,615 13 1	1,06,88,484 10 7	15 4 0
1910-1911 ...	1,22,97,870 15 11	20,08,127 9 6	53,376 8 1	20,61,504 1 7	1,02,36,366 14 4	16 12 3
1911-1912 ...	1,33,15,700 9 8	21,26,806 4 6	47,988 8 0	21,74,294 12 6	1,11,41,405 13 2	16 5 4

Owing to an increase in the receipts as well as in expenditure the percentage of charges remained almost the same as in the year 1910-11.

SALT.

SALT.

General sources of supply.

7. The salt with which the Bombay Presidency Salt Department has to deal may conveniently be classified under three heads :—

(1) Bárágrá or Rann salt, made from brine-wells on the edge of the Lesser Rann of Cutch in the two ágars of Khárághoda and Udu, six miles apart, and jointly named the Pritchard Salt Works. These are Government property and worked departmentally.

(2) Sea-salt made within the Presidency. Of this the one factory of Dharásna on the South Gujarát Coast near Bulsár, is both Government property and worked departmentally. The rest, with three exceptions, are grouped within a radius of 30 miles of Bombay City, and the few of them which are Government property are leased to private individuals for working; the majority are owned as well as worked privately.

(3) Imported salt, mostly from sea-salt-works in Goa territory.

Appendix G indicates the relative importance of these three sources of supply to the Presidency.

Salt is issued at a nominal duty of a pice per maund (to cover cost of establishment only) to 'Foreign Malabar', *i.e.*, to the States of Travancore and Cochin; and free of all duty to the States of Janjira, Cambay and Rádhanpur and the Estates of Pátri and Jhinjhuwáda on the Northern Frontier; also occasionally in replacement of duty-paid salt proved to have been lost at sea.

BARAGRA SALT.

DISTRIBUTION OF BARAGRA SALT.

Opening balance and year's produce.

8. The quantity of Bárágrá salt in stock at the beginning of the financial year was 21½ lákhs of maunds against 18¼ lákhs of maunds at the beginning of the previous year. The produce during the year under report amounted to 30¼ lákhs of maunds making with the quantity in stock a total of 51½ lákhs.

Removals.

9. The removals during the year amounted to 28¾ lákhs of maunds against 27½ lakhs in each of the two previous years. The increase is chiefly in removals to the United Provinces and the Central India. In the former case it is only 4 per cent. and is due to trade fluctuations, but in the case of Central India the large increase of about a lákh is attributable to the opening of the Nágda-Muttra Railway.

Distribution of Bárágrá salt.

10. The manner in which the issues of Bárágrá salt were distributed during the year under report is shown in Appendix A.

Distribution considered according to destination.

Local consumption.

11. The issues for local consumption are given in detail in Appendix B. It will be seen that, as compared with the removals during 1910-11, there has been an increase during the year under report in the removals to all places except Broach, Rewa Kántha, Pálanpur and Kathiáwár. In the last two cases the decrease should, I think, be attributed to the desertion of some of the villages owing to famine. The steady increase in removals to the Gaekwar's territory shows the satisfactory results of the establishment of the Jambusar Frontier.

12. For payment of duty, salt traders beyond the Presidency availed themselves of 21 treasuries and one Railway Station against 20 treasuries and two Railway Stations last year. At the Sehore Treasury collections were made only once during the year under report while no transactions took place last year. Duty was paid at the Sujaulpur Station only on the Indian Midland Railway. The subjoined statement shows how the different systems of payment of duty on Bárágrá salt have worked during the year under report compared with the previous year :—

Names of places at which duty was collected.	1910-1911.	1911-1912.
	Maunds.	Maunds.
Head-quarters Office, Bombay, Main Stores, Khárághoda, Ahmedabad Depôt, and Broach Customs House	10,74,582	9,69,190
At Treasuries beyond the Presidency	10,98,338	13,23,404
At Stations on the Indian Midland Railway	11,424	10,608
Total ...	21,84,339	23,03,202

Loss and wastage.

13. The amount of salt written off as loss and wastage was 2½ lákhs of maunds against half a lákh in the year 1910-11. But, as explained in the last year's report, the wastage of 68,872 maunds discovered on the clearance of open stores at the end of the season of 1910-11, which should, properly speaking,

have been included in the figures for 1910-11, has been included in the figures for 1911-12, as the stores were actually cleared in April 1911. The real loss and wastage should, therefore, be taken as 179,219 against 117,328 maunds in the previous year. The increase is due to the clearance of two heaps which had been exposed to the rains for 7 and 4 years respectively. The loss observed in the close stores was 2,801 maunds against 1,241 in the previous year, and that in the open stores 23,872 maunds against 68,872 in the year 1910-11 due to the very short rainfall during the year under report. On the whole the percentage of loss and wastage works out to 3·48 against 2·37 in the previous year.

Stock at the end of the year.

14. The quantity of Bárágrá salt in stock at the end of the financial year was 20¼ lákhs of maunds against 21¼ lákhs at the close of the previous year. If the 29 lákhs manufactured during the manufacturing season of 1911-12, but stored and brought to account after the close of the financial year, be added to that balance, the total stock amounts to 49¼ lákhs. The stock has again gone down owing to a rise in the sales, and is now considerably less than the average annual demand plus two years' reserve, the standard up to which we endeavour to work. Owing to scarcity of drinking water, additional pans could not be opened in the Pritchard Salt Works during the last manufacturing season. The produce at present is just sufficient to meet annual demands. In order to make up at least a year's reserve it is necessary to open the proposed salt-work between Khárághoda and Udu as soon as possible. I propose to do so in the next manufacturing season if the requisite sanction of Government is received in time and if conditions are favourable.

Cost price.

15. The cost price of Bárágrá salt including all charges remained the same as in the previous year, *viz.* 2 annas 6 pies per maund.

The manufacturing season.

16. The following table gives details of the manufacture of salt at the Pritchard Salt Works during the last two seasons :—

Salt Works.	Season.	Number of pans worked.	Total crop.	Average yield per pan.	Maximum yield per pan.
			Maunds.	Maunds.	Maunds.
Khárághoda	1910-11	255	15,06,492	5,908	9,867
	1911-12	255	13,29,790	5,211	10,637
Udu	1910-11	285	15,10,847	5,301	11,858
	1911-12	285	15,57,930	5,466	11,385
Total ...	1910-11	540	30,17,339	5,604	11,858
	1911-12	540	28,87,720	5,341	11,385

The number of pans worked during the last manufacturing season was the same as in the previous season, but the quantity produced was less by about 1¼ lákhs maunds, owing to violent sandstorms which continued almost without intermission from the beginning to the end of the manufacturing season, and which not only destroyed a large quantity of salt in the pans, but also affected the quality of the salt manufactured by weakening the brine, a consequence of which was that a much larger percentage than usual of the salt manufactured was condemned as unfit to be used. The conditions at Udu were less unfavourable than those at Khárághoda. Brine was let into the first pan at Khárághoda on the 11th October 1911 and into the last on the 2nd December 1911. The first pan was cleared on the 7th March 1912 and the last pan on the 5th April 1912. At Udu brine was let into the first pan on the 11th October 1911 and into the last on the 17th November 1911. The first pan was cleared on the 10th March 1912 and the last on the 17th April 1912.

Storage.

17. The storage operations began on the 1st April 1912 and ended on the 12th May 1912. The daily average of the storage was 68,755 maunds against 61,578 in the previous year. Owing to famine in Gujarát there was no scarcity of labourers this year. This, coupled with the extension of the open stores and the supply of a heavier engine, made it possible to complete the storage earlier

than usual. The engines for the removal of salt from the ágars to the stores were the same as last year and worked satisfactorily. With the strengthening of the main line and sidings in the Udu ágar recently carried out under the sanction conveyed in Government Resolution, Revenue Department, No. 2546 of 11th March 1911, it will be possible to complete the storage operations in a shorter time in future, provided the Railway Company supplies heavier engines with larger coal bunkers.

Cost price paid to Agrias.

18. The quantity of salt on which cost price at 1 anna 6 pies per Indian maund was paid to the ágrias during the manufacturing season of 1911-12 was 27½ lákhs of maunds, and the amount paid for it was Rs. 2,57,188. This, divided amongst 1,620 ágrias, gives Rs. 159 per head for a working season.

The Agency system.

19. The sales through the agencies within the Presidency are given in Appendix B. Two new agencies were opened during the year under report at Idar and Khed-Brahma on the Ahmedabad-Prántij Railway. An agency has also been substituted for a depôt at Ahmedabad from 15th October 1911. The Government Salt Agents still continue to hold a practical monopoly for the sale of Bárágrá salt in Gujarát, though the removals by private traders to places served by the agencies went up from 1,224 to 10,608 maunds during the year under report.

Water-supply.

20. The rainfall at Khárághoda during the year under report was 4·44 inches against 17·55 inches during the previous year. It was expected that owing to the scanty rainfall the water-supply at Khárághoda would fail before the commencement of the hot weather but, thanks to the steps taken by the Public Works Department from time to time by digging supplementary wells in the big tank, a fairly adequate quantity of water was supplied throughout the year in the village as well as in the ágars. Owing, however, to the failure of the past two monsoons and the curtailment of the catchment area of the big tank it cannot be depended upon to supply the needs of the increasing population of the village and the ágars. It was, therefore, proposed in October last that boring experiments should be made at Khárághoda and Government were pleased to sanction them as an urgent work, in their Resolution in the Public Works Department, No. C. W.—2237 of 15th November 1911. The actual boring operations were commenced on 3rd January 1912 and are still going on. The Public Works officials seem to be hopeful of tapping water at a depth of about 300 feet. At a depth of 237 feet a splendid flow of water was obtained but it was salt, and before it became fresh enough for potable purposes the pipe became choked up and the supply stopped.

Health of Khárághoda.

21. The vital statistics of the new Government village at Khárághoda during the year under report read as follows :—

There were 113 births or 42·4 per mille against 91 births or 38·2 per mille in the year 1910-11. The number of deaths was 73 or 27·4 per mille against 80 or 33·6 per mille in the previous year.

Population.

22. The population of the village was 2,662 during the year under report compared with 2,376 last year.

Khárághoda Dispensary.

23. The total number of patients treated at the dispensary was 4,106 against 4,510 during the previous year. The most common diseases were, as usual, malarial fever, ophthalmia, diseases of the digestive system and of the skin. There were three cases of small-pox in the village, of which one was imported.

Advances to Agrias.

24. The total amount advanced to ágrias as takávi during the year was Rs. 2,744 against Rs. 3,500 last year. The decrease is due to surplus amounts standing at the ágrias' credit.

SEA SALT.

Produce and sales.

25. The quantity of sea salt manufactured during the year was 102¾ lákhs of maunds against 99 lákhs in the previous year. The increase is no doubt partly due to the early cessation of the rains last year, which enabled the

Shilotris to commence manufacturing operations earlier than usual last season, but it is mainly attributable to the hope given to them that the scheme of opening a set of salt-works at Bhandup would be abandoned if the Shilotris could show that the existing works were capable of meeting the demand for salt. The figures quoted above do not, however, show the true effect of the pressure brought to bear on the salt manufacturers. The total amount of salt produced during the manufacturing season reached the unprecedented figure of 118 lákhs. The highest figure previously recorded for a working season was 100 lákhs. The increase in the produce was followed by an increase in the sales which rose from 93½ lákhs to 97½ lákhs during the year under report. It was chiefly in removals to the Madras Presidency and the Nizam's territory. The sales having outstripped the produce the closing balance was reduced by about half a lákh to 6½ lákhs of maunds.

Dharasna.

26. At the Government salt-works at Dharasna the year opened with a balance of only 11,968 maunds against 97,044 maunds in the previous year. Fortunately this year the season was very favourable for the manufacture of salt. A deficient monsoon prevented the complete destruction of the brackish composition of the soil of the pans and enabled manufacture to commence a month earlier. The produce therefore again went up from 3 to 4¼ lákhs. The removals, which were all for local consumption, amounted to 4 lákhs against 3½ lákhs in the previous year. The balance at the close of the year was 25,045 maunds against 11,968 maunds last year.

Rest of the Presidency.

27. In the other salt-works, private and leased, the aggregate produce was 98½ lákhs of maunds against 96 lákhs in the previous year, an increase of 2½ lákhs, which has already been explained in paragraph 25 above. The balance at the beginning of the year was 7 lákhs against 6¼ lákhs in the previous year; and the issues were 93¾ lákhs against 90 lákhs in 1910-11. The closing balance was 6,35,698 maunds against 6,87,557 maunds.

Distribution of sea-salt.

28. The quantities of sea salt which were removed for consumption within and without the Presidency from the sea salt-works in British territory during the year under report are compared with those of the previous year in Appendix D. It will be seen therefrom that there has been an increase of 4,57,413 maunds in the removals from salt-works near Bombay for consumption within and without the Presidency exclusive of Foreign Malabar. The decrease of 1,10,098 maunds in removals to Foreign Malabar—not a matter to be regretted—reduces the increase to 3,47,315 maunds.

Removals to Central Provinces and Central India.

29. The removals to the Central Provinces have increased by 1,12,827 maunds and have again reached the usual figure. Similarly the removals to Central India have also gone up by about 12,000 maunds. The variations are due to trade fluctuations and also to the fall in the price of salt at the salt-works owing to an increase in the produce.

Removals to Nizam's territory, Madras Presidency, Mysore, Foreign Malabar and Calcutta.

30. There has been an increase in removals to all other parts except Calcutta and Foreign Malabar. Removals to the Madras Presidency, Mysore and the Nizám's territory show substantial increases of 1,43,798, 61,842 and 1,06,571 maunds respectively, thus more than making up the ground lost in the previous year. In spite of the attempts made in the Madras Presidency to produce light salt, removals from this Presidency are steadily increasing, and this fact proves that consumers in Madras have a genuine preference for Bombay salt and that it is difficult to remove their prejudices against Madras salt. The falling off in the case of Foreign Malabar is probably the natural consequence of the unusually large removals in 1910-11. Calcutta shows a decrease of over a lákh of maunds, due probably to larger imports from Great Britain.

Maroli, Shiroda and Sanikatta.

31. Practically all the issues from Maroli, Shiroda and Sanikatta are for local consumption, and the variations in them are too slight to require explanation.

Loss and wastage.

32. The loss and wastage returned at Dharasna was 24,218 maunds against 22,328 maunds in the previous year, out of which 24,097 is reported to be due to over-estimation.

33. At the other sea salt-works the loss and wastage amounted to 5¼ lákhs of maunds against 5½ lákhs in the previous year, as shown below :— Rest of the Presidency.

	Maunds.
Wastage from moisture	69,622
Loss by over-estimation	4,22,245
„ by theft	6
„ by destruction of unsaleable refuse salt	37,731
	5,29,604

The percentage of loss and wastage is 5·03 against 5·3 in the previous year, which is satisfactory as indicating either better thatching of heaps or more accurate estimating of their contents.

34. The following table shows the maximum, the minimum and average prices of salt of the Northern and middle Konkan, Shiroda and Sannikatta salt-works :—

	Northern and Middle Konkan.				Shiroda.				Sanikatta.			
	1910-11.		1911-12.		1910-11.		1911-12.		1910-11.		1911-12.	
	Rs. a. p.		Rs. a. p.		Rs. a. p.		Rs. a. p.		Rs. a. p.		Rs. a. p.	
Maximum per maund ...	0 12	0	0 8	0	0 6	0	0 6	0	0 6	0	0 6	0
Minimum do. ...	0 0	3	0 0	3	0 1	6	0 1	0	0 2	0	0 2	6
Average do. ...	0 2	0	0 2	0	0 3	9	0 3	10	0 2	11	0 3	6

Very few transactions took place at the highest and the lowest prices. The rates generally prevailing were 4, 3, 2 and 1 anna and 3 pies per maund in the northern and middle Konkan and 3 and 4 annas in Shiroda and 2 annas six pies, 3 annas and 5 annas in Sanikatta. The variations in the average rate are trifling as compared with the rate for the last year.

IMPORTED SALT.

35. The quantity and distribution of salt imported into the Bombay Presidency are given in Appendix E. Quantity and distribution of imported salt.

36. The quantity of Goa salt imported during the year was nearly the same as in the previous year, *viz.*, 3½ lákhs. The greater part was as usual imported by rail for Belgaum, Dhárwár, Bijápur, Madras and Mysore. The imports for the Madras Presidency show a very slight increase but those for Mysore appear to be steadily decreasing. Removals of Goa salt to the Nizam's territory ceased altogether during the year under report.

37. No duty-paid Bombay salt was imported at Castle Rock during the year under report. Through salt.

38. The total quantity of salt issued and imported for consumption in the Bombay Presidency amounted to— Consumption for the whole of the Presidency.

	Maunds.
Bárágrá salt	5,83,729
Sea salt	26,91,790
	32,75,519
Imported salt	2,69,925
	35,45,444

Taking the population at 2,21,45,972 according to the Census of 1911, the average per head is 13·2 lbs. against 12·5 lbs. in the previous year.

In Gujarát.

39. The quantity of salt removed for consumption in Gujarát was :—

	Maunds.
Bárágra salt for local consumption	5,76,379
Dharasna salt	3,81,203
Konkan salt	22,917
	9,80,499
Imported salt	26
	9,80,525

This quantity distributed amongst a population of 65,30,918 gives an average of 12·4 lbs. against 11·7 lbs. per head last year.

In the rest of the Presidency.

40. The quantity of salt issued for local consumption in other parts of the Presidency, *viz.*, the Konkan, the Deccan, the Southern Marátha Country and North Kánara may be estimated as under :—

	Maunds.
Quantity of salt issued for the whole of the Presidency ...	35,45,414
Deduct—	
Quantity of salt issued for Gujarát	9,80,525
	25,64,919

The population affected being taken at 1,56,15,054, the average per head comes to 13·5 lbs. against 12·8 lbs. in the previous year.

41. The average market prices of salt in each district of the Presidency during the last four years will be found in Appendix H.

On comparison of the recorded prices for the year 1911-12 with those for the previous year, it will be seen that the prices in the Ahmedabad, Kaira, Panch Maháls and Broach Districts, where Bárágrá salt is served through the agencies at a fixed price, remained stationary. The difference in the price in all the other districts except West Khándesh, Sátára, Ahmednagar, Belgaum, Dhárwár, Bijápur and Ratnágiri is insignificant, and attributable to ordinary trade fluctuations. On enquiries made through the Collectors of the districts I learn that the rise in the price of salt in the first six districts is due to the rise in the price of gunny bags. In the case of Belgaum the rise is also partly due to an increase in the Railway freight. The practice of issuing salt from the Fish-Curing yards in the Ratnágiri District for human consumption during the monsoon seems to have had a salutary effect on the market price of salt in that district which has gone down by about 6 annas. The steady decline in the price of salt in Bombay is satisfactory.

REVENUE AND EXPENDITURE.

SALT REVENUE.

Revenue and Expenditure.

42. The receipts and expenditure on account of salt revenue for the year under report are shown in Appendix I. An explanation of some of the chief items on both sides of the accounts is given below.

Items of increases in Revenue.

43. The increase of Rs. 50,834 under "Proceeds of sale of Government Salt" is due to larger removals of Bárágra salt and that of Rs. 9,28,429 under "Excise duty" is due (1) to larger issues of salt and (2) to an increase in collections during the year in respect of salt to be issued in the following year. Appendix J shows what the transactions—credit and cash—have been during the past three years. The realisations under "Recovery of Salt Agents' bagging and sewing charges" have also gone up by Rs. 47,476 owing to a rise in the price of gunny bags.

Items of decrease in Revenue.

44. The decrease of Rs. 14,071 under "Duty on Salt imported by Land" is due to decreased importation of Goa Salt.

Items of increase in expenditure.

45. The increase of Rs. 24,967 under "Pay of Subordinate Establishment" is due to the revision of pay of the menial establishment and the creation of new posts of peons. The increases of Rs. 34,729 and Rs. 34,754 under "Bonus allowance" and "Grain Compensation allowance" respectively are due

to the fact that no such allowances were paid in the previous year. The expenditure under "Peon's clothing" shows an increase of Rs. 27,733 owing to the supply of first year's clothing to the peons on the Northern Frontier and in the Presidency Division. The increase of Rs. 33,631 under "Salt agents' bagging and sewing charges" is, as explained above, due to a rise in the price of gunny bags.

Items of decrease in expenditure.

46. The decrease of Rs. 44,135 under "Purchase of land" is due to the additional compensation paid in 1910-11 on account of the land acquired for the Bhándup salt works. The decrease of expenditure under "Purchase of boats" is due to the fact that no expenditure was incurred in purchasing new boats during the year.

MISCELLANEOUS.

Fish-curing yards.

47. The number of fish-curing yards open for business was the same as last year, *viz.*, 31, of which 17 are in the Rátnagiri District and 14 in the Kánara District.

48. Appendix K shows in detail the transactions at all the yards during the year under report. The total quantity of fish brought to be cured rose from 2,31,286 to 2,48,332 maunds and the quantity of salt issued from 68,768 to 74,454 maunds. Though the transactions shew a slight improvement the fishing season was not a good one for the larger and better kinds of fish.

49. The larger quantity of fish brought to the yards, accounts for the larger quantity cured, *viz.*, 1,87,065 against 1,76,900 maunds in the previous year. The proportion of weight of fresh fish to each maund of salt was 3·3 against 3·44 in the previous year. At all the yards in the Ratnágiri District, the proportion was almost uniform as usual, but in the Kánara District it varied from 3 to 6 due to the difference in the methods employed by the Ratnágiri and the Mapila fishermen, both of whom resort to the Kánara yards.

50. The financial results of the working of the yards during the year under report are not altogether satisfactory. They show a net loss of Rs. 795 against a profit of Rs. 9,892 in the previous year. This is mainly due to the reduction in the cost price of salt issued to fish-curers from 8 to 7 annas.

51. In the Ratnágiri District only 4 yards, *viz.*, Ratnágiri, Borya, Jaygad and Shiroda have worked at a profit, and in the Kánara District all the yards, except Kasárkod, Kumta, Keni and Tádri, have worked at a profit. Taken together, the yards in the Ratnágiri District show a net loss of Rs. 2,529 against a profit of Rs. 6,466 in the previous year and those in Kánara a net profit of Rs. 1,734 against Rs. 3,426 in the previous year.

52. During the year under report fish-curers were allowed to take salt to sea for curing purposes, but they availed themselves of the concession at Ratnágiri only. The methods of fishing differ considerably south of Viziadurg where deep sea fishing is not so largely indulged in and the fishermen do not seem inclined to take advantage of the concession.

The construction of pucca sheds as suggested by the Honourable Mr. Lucas appears to be too costly to be practicable and does not seem to meet the requirements of the fish-curers. I have therefore recently suggested that the existing structures should remain unaltered.

Offences

53. The details of offences against the salt law during the year under report are given in Appendix L. The total number of cases detected was 105 against 135 in the previous year. Out of these 30 were of clandestine removal of natural salt—6 in the Northern Division and 24 in the Southern Division.

54. The number of cases of smuggling foreign salt across the Frontier was 26 against 34 in the previous year—2 on the Daman Frontier and 24 on the

Goa Frontier. There were 15 cases of theft from salt-works against 13 in the previous year, the quantity of salt stolen being 22 maunds against 15 in the previous year.

55. The percentage of convictions to persons sent up for trial was 96·12 against 98·37. The sentences passed by the Magistrates may, on the whole, be considered sufficiently deterrent.

Payment of compensation awarded by the Mixed Commission.

56. No payments were made on account of awards of the Mixed Commissions of 1880, 1885 and 1892 during the year under report and the balance remaining unpaid is therefore the same as last year, *viz.*, Rs. 2,250. The non-payment is due to the failure of the persons entitled to the money to put in their claims.

Farms of Government salt-works.

57. Under Government Resolution, Revenue Department, No. 7597 of 12th August 1911, the lease of the three Government salt-works at Mátunga was renewed to the old lessees for a further period of five years on payment of an annual rental of Rs. 14,000. The previous lease was for Rs. 18,501 per annum. The apparent falling off is due to the fact that the former lease was in respect of four salt-works whereas the current lease is for three works only, the Wadála salt-work having been handed over to the Bombay Port Trust for trade purposes.

The five years' lease of the four Government salt-works at Bassein having also expired during the year under report, they were re-leased for a period of three years on payment of an annual rental of Rs. 26,100 which exceeds the amount received annually during the former lease by Rs. 3,600.

The small Government salt-works at Shenwa in the Uran Táluka was also re-leased for a period of five years for an annual rental of Rs. 710. During the previous lease Rs. 525 per annum were realised.

The nine Government salt-works at Shiroda were leased during the year under report for a period of one year only for Rs. 2,501 as better offers for a longer period could not be received owing to plague. The former lease was for Rs. 3,500 per annum.

RELATIONS WITH NATIVE STATES.

Baroda.

58. The rules for the prevention of illicit manufacture and collection of salt and contraband traffic in salt in certain parts of Baroda Territory, which were introduced in 1905-06, continue to work well.

Cambay and Janjira.

59. The conditions of the conventions with Cambay and Janjira have, as before, been faithfully observed.

CONCLUDING REMARKS.

60. The balance of salt in the sea salt-works, including Dhárásna, on the 30th June this year, was 62 lákhs of maunds against 47½ lákhs on the same date last year. This balance includes the produce of the whole season less sales up to 30th June, whereas that shown in paragraph 25 above represents the balance at the end of the financial year, *i. e.*, in the middle of the manufacturing season, and does not serve as a reliable guide to the sufficiency or otherwise of stocks. The balance is more than sufficient to meet requirements till new salt is in the market next season. The average annual sales during the last few years have been 92 lákhs of maunds representing an average sale of over 7⅔ lákhs of maunds a month. During July, August and September, however, business is practically at a standstill, and in October and November removals are not brisk. It appears that the existing salt-works are capable of producing considerably more than sufficient salt to meet our requirements. I do not therefore see any necessity at present for opening new salt-works at Bhándup, and have reported accordingly.

61. During the year under report the salt and opium depôt at Ahmedabad was replaced by an agency as the cost of the depôt was found to be incommensurate with the advantages gained. The opium work has been

transferred to the liquor warehouse-keeper at Ahmedabad and the buildings have been handed over to the B. B. & C. I. Railway for the extension of their goods yard.

62. The new dockyard and premises for the Coast Guard Fleet at Sewri having been ready for occupation during the year under report, the stores and boats were removed from Mazgáon to Sewri early in April last. The Sewri Dockyard being far away from the Town Custom House it was not possible for the Assistant Collector, Coast Guard Service, to keep a close watch on the work in the godown. His office has therefore been removed to the new dockyard and has been temporarily located in the Inspector's office-room, pending construction of a new office for him.

63. Owing to the early cessation of the rains, the water-supply in the several tálukas was insufficient and measures therefore had to be taken on a much larger scale than usual for the supply of drinking water to the establishment in the different tálukas.

With regard to the water-supply of the Rái Táluka it is now proposed to join in the scheme which is being worked out by the Special Officer, Sálsette Building Sites, for the supply of water to the whole of Sálsette. The Executive Engineer has temporarily improved the Dhárávi reservoir which, it is hoped, would supply water to the establishment at Rái till the proposed scheme is carried out.

Plans and estimates for improving the water-supply of the Trombay Táluka are before Government.

The Public Works Department are still investigating the scheme for the supply of water to the Uran Mahál.

64. In May 1911 the peons employed in the Uran and Shewa Tálukas threatened to strike if their pay was not immediately raised. They were given assurance that the matter was receiving careful consideration and would be decided as early as possible. Some of the peons, who had been backed up by some one in authority, threatened to resign on 10th June 1911. They were warned that if they did not withdraw their resignations within 48 hours they would be reduced one grade. This had no effect. Three of the ringleaders were therefore suspended. This action produced a good result. Almost all the peons withdrew their resignations. Those who were reported to be leaders in the movement or more guilty of insubordinate conduct were suitably punished.

65. The officers of the Department with few exceptions worked exceedingly well.

66. In a footnote to the Administration Report for 1910-11, Mr. Enthoven remarked that it was capable of much curtailment and that he proposed to submit proposals for its curtailment or abolition in favour of a triennial review. He had not time, however, to carry out this intention, but I intend shortly to submit proposals which, if accepted, will make the report considerably shorter.

I have the honour to be,

Sir,

Your most obedient servant,

W. C. SHEPHERD,
Collector of Salt Revenue.

APPENDIX A.

Statement showing the Distribution of Bárágrá Salt during the years 1910-11 and 1911-12.

	1910-1911.					1911-1912.					
	For Local consumption.	For export by Railway to Central Provinces.	For export by Railway to United Provinces of Agra and Oudh.	For export to Central India, including Málwa and Rájputána.	Total.	For Local consumption.	For export by Railway to Central Provinces.	For export by Railway to United Provinces of Agra and Oudh.	For export to Central India, including Málwa and Rájputána.	Total.	Remarks.
	Mds. s.	Mds. s.	Mds. s.	Mds. s.	Mds. s.	Mds. s.	Mds. s	Mds. s.	Mds. s.	Mds. s.	
Khárághoda...	93,811 20	6,69,528 0	10,22,787 0	4,25,644 0	22,10,170 20	88,263 20	6,49,128 0	10,70,172 0	5,10,810 0	23,18,373 20	
Ahmedabad ...	60,677 0	...	...	...	60,677 0	35,114 0	...	...	...	35,114 0	
Agencies ...	4,18,876 0	...	...	66,480 0	4,85,356 0	4,60,352 0	...	...	73,091 0	5,33,444 0	
Total ...	5,71,864 20	6,69,528 0	10,22,787 0	4,92,024 0	27,56,203 20	5,83,729 20	6,49,128 0	10,70,172 0	5,83,903 0	28,86,931 20	

APPENDIX B.

Statement showing in detail the Issues of Bárágrá Salt for Local Consumption during the years 1910-11 and 1911-12.

District.	From							
	Khárághoda.		Ahmedabad.		Agencies.		Total.	
	1910-11.	1911-12.	1910-11.	1911-12.	1910-11.	1911-12.	1910-11.	1911-12.
	Mds. s.	Mds. s.	Mds. s.	Mds. s	Mds. s.	Mds. s.	Mds. s.	Mds. s.
Ahmedabad ...	7,884 20	16,594 20	60,060 0	34,789 0	69,036 0	84,825 0	1,36,980 20	1,36,208 20
Kaira ...	4,080 0	3,672 0	69 0	58 0	94,308 0	1,03,664 0	98,457 0	1,07,394 0
Broach ...	5,712 0	4,488 0	...	...	...	...	5,712 0	4,488 0
Surat ...	.....	1 0	...	...	...	...	.....	1 0
Panch Maháls ...	6,936 0	7,752 0	...	...	53,241 0	59,901 0	60,177 0	67,653 0
Gáikwár's Territory ...	36,845 0	32,256 0	130 0	10 0	1,00,434 0	1,06,313 0	1,36,909 0	1,38,579 0
Mahi Kántha Agency ...	2,497 0	2,792 0	418 0	239 0	42,945 0	47,388 0	45,860 0	50,419 0
Rewa Kántha Agency ...	5,304 0	4,899 0	...	18 0	22,206 0	19,986 0	27,510 0	24,903 0
Pálanpur Agency ...	13,883 20	5,841 20	...	...	27,015 0	28,308 0	40,898 20	34,149 20
Káthiáwár Agency ...	2,628 20	2,120 20	...	...	15 0	...	2,638 20	2,120 20
Cambay ...	500 0	500 0	...	...	9,676 0	9,964 0	10,176 0	10,464 0
Bombay ...	3,634 0	4,491 0	...	...	...	3 0	3,634 0	4,494 0
Khándesh, East ...	2,856 0	2,856 0	...	...	...	...	2,856 0	2,856 0
Poona ...	6 0	.....	...	...	...	...	6 0	.....
Total ...	92,311 20	88,263 20	60,677 0	35,114 0	4,18,876 0	4,60,352 0	5,71,864 20	5,83,729 20

W. C. SHEPHERD,
Collector of Salt Revenue.

APPENDIX C.

Statement of the Produce and Sales of Salt manufactured in the Bombay Presidency for the year ending 1911-1912.

Divisions.	Tálukas.	Number of Sázas.	Number of Salt Works.	Balance at the commencement of the year.	Produce. Estimated contents of heaps.	Produce. Excess over Estimate of lots disposed of.	Produce. Total according to revised Estimates.	Total of Balance and Produce.
	Ahmedabad Collectorate.			Mds. s. t.	Mds. s. t.	Mds. s. t.	Mds. s. t.	Mds. s. t.
Gujarát Division.	Khárághoda ...	2	2	21,03,599 14 0	29,84,198 0 0	4 17 0	29,84,202 17 0	50,87,801 31 0
	Ahmedabad ...	...	...	33,625 0 0	33,141 0 0	964 0 0	34,105 0 0	67,930 0 0
	Total ...	2	2	21,37,424 14 0	30,17,339 0 0	968 17 0	30,18,307 17 0	51,55,731 31 0
	Surat Collectorate.							
	Dhárásna ...	1	1	11,968 0 0	4,03,042 0 0	29,580 0 0	4,32,622 0 0	4,44,590 0 0
	Thána Collectorate.							
Konkan Division.	Maroli ...	1	1	758 0 0	15,915 0 0	687 0 0	16,602 0 0	17,360 0 0
	Bassein ...	7	29	1,06,351 0 0	14,73,706 12 0	1,13,398 5 0	15,87,104 17 0	16,93,455 17 0
	Rai ...	9	46	1,02,661 20 0	11,88,512 0 0	1,12,222 5 0	13,01,034 5 0	14,03,695 25 0
	Trombay ...	4	24	44,289 30 0	9,13,865 0 0	78,222 10 0	9,92,087 10 0	10,36,327 0 0
	Island of Bombay— Mátunga ...	6	28	44,630 0 0	9,43,165 0 0	83,221 0 0	10,26,386 0 0	10,71,216 0 0
	Kolába Collectorate.							
	Belápur ...	6	19	49,763 34 40	7,15,425 0 0	62,288 15 40	7,77,713 15 40	8,27,477 10 0
	Uran ...	5	40	21,017 20 0	9,81,310 0 0	93,256 0 0	10,74,566 0 0	10,95,583 20 0
	Pen ...	5	28	67,139 2 40	8,23,158 0 0	22,448 19 0	8,45,606 19 0	4,02,745 21 40
	Karanja ...	4	24	19,304 20 0	7,41,507 0 0	42,387 10 0	7,83,894 10 0	8,03,098 30 0
	Shewa ...	6	41	67,178 10 0	16,28,138 0 0	1,96,904 0 0	18,20,042 0 0	18,87,220 10 0
	Ratnágiri Collectorate.							
	Shiroda ...	1	27	47,097 20 0	80,500 20 0	5,077 0 0	85,577 20 0	1,32,675 0 0
	Kánara Collectorate.							
	Sanikatta ...	1	128	1,27,316 0 0	27,895 0 0	4,705 0 0	32,600 0 0	1,59,916 0 0
	Total ...	55	430	6,87,556 37 0	90,28,396 32 0	8,14,816 24 40	98,43,213 16 40	1,05,30,770 13 40
	Grand Total ...	58	433	28,86,949 11 0	1,24,48,777 32 0	8,45,365 1 40	1,32,94,142 33 40	1,61,31,092 4 40

Division.	Tálukas.	Sales. On payment of Full Duty.	Sales. On payment of Nominal Duty.	Sales. Free of Duty.	Sales. Total.	Amount of Excise Duty collected.	Loss and Wastage.	Total of Sales and Loss and Wastage.	Balance in hand at the close of the year.
	Ahmedabad Collectorate.	Mds. s. t.	Mds. s.	Mds. s.	Mds. s. t.	Rs. a. p.	Mds. s. t.	Mds. s. t.	Mds. s. t.
Gujarát Division.	Khárághoda ...	28,50,286 0 0	.....	1,531 20	28,51,817 20 0	29,69,923 0 0	2,48,047 11 0	30,99,864 31 0	19,87,937 0 0
	Ahmedabad ...	35,114 0 0	.....	...	35,114 0 0	35,114 0 0	44 0 0	35,158 0 0	*32,772 0 0
	Total ...	28,85,400 0 0	.....	1,531 20	28,86,931 20 0	30,05,037 0 0	2,48,091 11 0	31,35,022 31 0	20,20,709 0 0
	Surat Collectorate.								
	Dhárásna ...	3,95,327 0 0	.....	...	3,95,327 0 0	3,85,123 0 0	24,218 0 0	4,19,545 0 0	25,045 0 0
	Thána Collectorate.								
Konkan Division.	Maroli ..	15,309 0 0	.....	...	15,309 0 0	15,309 0 0	421 0 0	15,730 0 0	1,630 0 0
	Bassein ...	15,28,762 10 0	.....	...	15,28,762 10 0	15,25,255 14 0	55,909 17 0	15,84,671 27 0	1,08,783 30 0
	Rai ...	12,01,321 10 0	.....	...	12,01,321 10 0	12,30,776 12 0	1,01,469 35 0	13,02,791 5 0	1,00,904 20 0
	Trombay ...	9,33,714 20 0	.....	...	9,33,714 20 0	9,17,315 12 0	56,504 10 0	9,90,218 30 0	46,108 10 0
	Island of Bombay— Mátunga ...	9,86,022 30 0	.....	20 20	9,86,043 10 0	9,46,809 12 0	42,468 0 0	10,28,511 10 0	42,704 30 0
	Kolába Collectorate.			...					
	Belápur ..	7,60,750 0 0	.....	287 0	7,61,037 0 0	7,50,153 0 0	33,692 20 0	7,94,729 20 0	32,747 30 0
	Uran ...	6,11,883 30 0	3,37,314 0	62,216 10	10,11,414 0 0	6,42,000 10 0	58,193 10 0	10,64,607 10 0	30,976 10 0
	Pen ...	3,19,817 20 0	... ...	...	3,19,817 20 0	3,14,626 12 0	35,341 21 40	3,55,159 1 40	47,586 20 0
	Karanja ...	3,03,751 0 0	3,38,754 0	...	6,42,505 0 0	3,43,285 8 0	47,054 10 0	6,89,559 10 0	1,18,539 20 0
	Shewa ...	16,70,902 10 0	83,242 0	2,880 0	17,57,024 10 0	16,81,349 4 0	85,584 20 0	18,42,608 30 0	44,611 20 0
	Ratnágiri Collectorate.								
	Shiroda ...	85,478 0 0	.....	500 0	85,978 0 0	85,478 0 0	9,099 0 0	95,077 0 0	37,598 0 0
	Kánara Collectorate.								
	Sanikatta ..	1,02,535 0 0	.....	20,008 0	1,22,543 0 0	1,02,535 0 0	8,866 0 0	1,31,409 0 0	28,507 0 0
	Total ...	85,20,247 10 0	7,59,310 0	85,911 30	93,65,469 0 0	85,54,895 4 0	5,29,603 23 40	98,95,072 23 40	6,35,697 30 0
	Grand Total ...	1,13,90,974 10 0	7,59,310 0	87,443 10	1,26,47,727 20 0	1,19,45,055 4 0	8,01,912 34 40	1,34,49,640 14 40	26,81,451 30 0

* This balance was transferred to the Main Stores accounts when the Ahmedabad Depôt was abolished.

W. C. SHEPHERED,
Collector of Salt Revenue.

APPENDIX D.

Comparative Statement showing the Quantities of Salt removed for consumption within and without the Presidency from the Sea Salt Works in British Territory, together with the distribution of Issues.

	For Export to									
	Central Provinces.		Central India.		Nizám's Territory.		Calcutta.		Madras Presidency. British Malabár.	
	1910-1911.	1911-1912.	1910-1911.	1911-1912.	1910-1911.	1911-1912.	1910-1911.	1911-1912.	1910-1911.	1911-1912.
	Mds.	Mds.	Mds.	Mds.	Mds.	Mds.	Mds.	Mds.	Mds.	Mds.
Dhárasna	...	...	...	...	...	...	...	...	...	...
Maroli	...	...	...	...	...	...	...	...	...	...
Bassein, Rai, Mátunga, Trombay, Uran, Shewa, Belápur, Karanja and Pen.	15,15,658	16,28,485	15,242	27,564	13,10,960	14,17,531	9,43,874	8,33,907	13,66,936	14,54,947
Shiroda	...	...	...	...	...	...	...	...	14,469	16,184
Sánikatta	...	...	...	...	...	...	...	...	...	...
Total ...	15,15,658	16,28,485	15,242	27,564	13,10,960	14,17,531	9,43,874	8,33,907	13,81,405	14,71,131

	For Export to											
	Madras Presidency—*continued.*				Foreign Malabár.		Mysore.		Within the Presidency.		Total.	
	Rest of the Presidency.		Total.									
	1910-1911.	1911-1912.	1910-1911.	1911-1912.	1910-1911.	1911-1912.	1910-1911.	1911-1912.	1910-1911.	1911-1912.	1910-1911.	1911-1912.
	Mds.	Mds.	Mds.	Mds.	Mds.	Mds.	Mds.	Mds.	Mds.	Mds.	Mds.	Mds.
Dhárasna ...	...	...	...	...	...	...	...	...	3,57,055	3,95,827	3,57,055	3,95,827
Maroli ...	...	...	...	...	...	...	...	...	12,439	15,309	12,439	15,309
Bassein, Rai, Mátunga, Trombay, Uran, Shewa, Belápur, Karanja and Pen.	3,25,970	3,81,757	16,92,906	18,36,704	8,69,408	7,59,310	4,86,978	5,48,820	19,59,298	20,89,318	87,94,324	91,41,639
Shiroda ...	...	...	14,469	16,184	...	...	...	...	59,254	69,794	73,723	85,978
Sánikatta ...	120	501	120	501	...	...	32	...	1,20,620	1,22,042	1,20,772	1,22,543
Total ...	3,26,090	3,82,258	17,07,495	18,53,389	8,69,408	7,59,310	4,87,010	5,48,820	25,08,666	26,91,790	93,58,313	97,60,796

W. C. SHEPHERD,
Collector of Salt Revenue.

APPENDIX

Statement showing Quantities of Foreign Salt imported by Sea

Description of Salt.	Importations by Sea.					Place of Export.
	Place of Export.	Place of Import.	Mode of Conveyance.	Quantity imported.	Amount of Import Duty levied.	
				Mds. s. t.	Rs. a. p.	
Table and Packing Salt.	United Kingdom.	Bombay ...	Steamer ...	14,307 36 19	14,308 6 1	
Do. ...	Holland ...	Do. ...	Do. ...	118 35 0	118 14 0	
Do. ...	United States of America.	Do. ...	Do. ...	0 39 0	0 15 7	
Do. ...	New South Wales.	Do. ...	Do. ...	21 0 0	21 0 0	
Do. ...	Natal ...	Do. ...	Do. ...	5 22 40	5 9 0	
Do. ...	Ceylon ...	Do. ...	Do. ...	7 26 0	7 10 5	
Do. ...	Victoria ...	Do. ...	Do. ...	4 10 0	4 4 0	
Do. ...	France ...	Do. ...	Do. ...	2 17 18	2 7 0	
Common Salt ...	Arabia ...	Do. ...	Do. ...	55 12 0	55 4 10	
Packing Salt ...	Straits Settlements.	Do. ...	Do. ...	2 22 0	2 8 10	
Do. ...	Hongkong...	Do. ...	Do. ...	1 38 0	1 15 0	
Do. ...	Japan ...	Do ...	Do. ...	0 20 0	0 8 0	
Do. ...	Unknown ...	Do. ...	Do. ...	4 7 40	4 3 0	
Black Salt ...	Káthiáwár ...	Do. ...	Country Craft .	2,139 12 0	2,139 4 9	
Common Salt ...	Bassorah ...	Kánara District.	Do. ...	2 7 0	2 3 2	
Goa Salt ...	Goa ...	Bombay ...	Steamer ...	2 0 0	2 0 0	
Do. ...	Do. ...	Kánara District.	Country Craft .	0 3 0	0 1 2	
			Total ...	16,676 27 37	16,677 2 10	.....
Káthiáwár Salt ...	.....	.....	.....	.....	.....	Gogha ...
Goa Salt ...	.....	.....	.....	.....	.....	Kárwár ...
Do. ...	.....	.....	.....	.....	.....	Diggi ...
Do. ...	.....	.....	.....	.....	.....	Bánda ...
Do. ...	.....	.....	.....	.....	.....	Talevádi ...
Do. ...	.....	.....	.....	.....	.....	Castle Rock ...
Do. ...	.....	.....	.....	.....	.....	.....
Do. ...	.....	.....	.....	.....	.....	.....

E.

and by Land into the Bombay Presidency during the year 1911-1912.

Importations by Land.					Total of Imports by Sea and Land.	
Place of Import.	By what Route.	Mode of Conveyance.	Quantity imported.	Amount of Import Duty levied.	Quantity imported	Amount of Import Duty levied.
			Mds. s. t.	Rs. a. p.	Mds. s. t.	Rs a. p.
.....	.....	.....	.....	.....	16,676 27 37	16,677 2 10
Ahmedabad District.	Bhávnagar and Gogha.	Cart-loads ...	26 13 60	26 5 6		
Bombay Presidency.	Goa Frontier.	Head and bullock loads.	2,987 15 40	2,987 3 11		
Do. ...	Do. ...	Do. ...	1,793 21 40	1,793 5 3		
Do. ...	Do. ...	Do. ...	6,082 30 0	6,082 9 11		
Do. ...	Do. ...	Do. ...	319 22 40	319 9 0		
Do. ...	Do. ...	Rail ...	2,42,039 1 40	3,34,157 11 0		
Madras Presidency.	Do. ...	Do. ...	20,698 7 0			
Mysore ...	Do. ...	Do. ...	71,420 27 0			
		Total ...	3,45,367 18 60	3,45,366 12 7	3,45,367 18 60	3,45,366 12 7
		Grand Total ...	.....	.....	3,62,044 6 17	3,62,043 15 5

W. C. SHEPHERD,
Collector of Salt Revenue.

APPENDIX F.

Statement showing the quantity of each description of Salt imported and delivered from Salt Works in the Bombay Presidency during the years 1910-1911 and 1911-1912.

Description of Salt.	1910-1911.		1911-1912.		Remarks.
	Quantity.	Amount realised.	Quantity.	Amount realised.	
	Mds. s. t.	Rs. a. p.	Mds. s. t.	Rs. a. p.	
Bárágrá Salt ...	27,56,203 20 0	26,85,525 0 0	28,86,931 20 0	30,05,037 0 0	
Sea Salt ...	97,17,731 2 30	86,92,206 10 3	1,01,06,139 8 0	92,85,360 12 3	
Sindha Salt ...	93 18 40	93 7 5	.....	.....	
Table Salt, Packing and Common Salt.	15,064 10 47	15,064 6 10	14,535 12 37	14,535 12 11	
Bhávnagar Black Salt (Sanchal).	2,857 35 60	2,857 14 5	2,165 25 60	2,165 10 3	
Total ...	1,24,91,950 7 17	1,13,95,747 6 11	1,30,09,771 26 17	1,23,07,099 3 5	

APPENDIX G.

Details of Issues of Salt from different sources of supply during the years 1910-11 and 1911-12.

	Full Duty.		Nominal Duty.		Free.		Total.	
	1910-1911.	1911-1912.	1910-1911.	1911-1912.	1910-1911.	1911-1912.	1910-1911.	1911-1912.
	Mds. s.	Mds. s.	Mds.	Mds.	Mds. s.	Mds. s.	Mds. s.	Mds. s.
Barágra Salt ...	27,54,672 0	28,85,400 0	...	...	1,531 20	1,531 20	27,56,203 20	28,86,931 20
Sea Salt ...	88,72,354 30	89,15,574 10	8,69,408	7,59,310	1,16,550 19	85,911 30	93,58,313 9	97,60,796 0
Imported Salt ...	3,77,433 18	3,62,044 6	...	...	...	...	3,77,433 18	3,62,044 6
Total ...	1,15,04,460 8	1,21,63,018 16	8,69,408	7,59,310	1,18,081 39	87,443 10	1,24,91,950 7	1,30,09,771 26

W. C. SHEPHERD,
Collector of Salt Revenue.

APPENDIX H.

Statement showing the average market prices of Salt in each District of the Bombay Presidency during the financial years 1908-09, 1909-10, 1910-11 and 1911-12.

District.	1908-09. Duty Re. 1.	1909-10. Duty Re. 1.	1910-11. Duty Re. 1.	1911-12. Duty Re. 1.
	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
Bombay	2 6 1	2 7 0	2 5 1	2 2 0
Ahmedabad	1 8 2	1 8 2	1 8 2	1 8 2
Kaira	1 8 2	1 8 2	1 8 2	1 8 2
Panch Maháls	1 9 ½	1 9 7	1 9 7	1 9 7
Broach	1 8 7	1 9 10	1 10 0	1 10 0
Surat	1 7 5	1 8 2	1 8 8	1 8 0
Thána	1 10 2	1 10 11	1 11 8	1 11 8
Kolába	1 13 7	1 12 7	2 0 3	1 12 0
Ratnágiri	1 13 3	1 12 6	2 1 1	1 11 4
Kánara	2 2 4	2 1 8	2 0 10	2 0 5
Násik	1 13 1	1 11 0	1 12 5	1 12 10
Khándesh, West	2 0 7	1 15 2	1 15 6	2 3 8
Khándesh, East	2 5 4	2 6 3	2 5 6	2 5 6
Ahmednagar	1 13 0	2 4 9	2 5 6	2 6 10
Sholápur	2 3 4	2 2 4	2 2 0	2 2 8
Poona	1 11 9	1 12 7	2 2 11	2 2 10
Sátára	2 2 1	2 0 3	2 0 0	2 1 6
Belgaum	2 1 1	1 15 0	1 14 10	1 15 10
Dhárwár	1 13 1	1 14 4	1 14 3	1 15 1
Bijápur	2 0 3	1 14 0	1 15 3	2 0 6

W. C. SHEPHERD,
Collector of Salt Revenue.

APPENDIX I.

Statement showing Details of Receipts and Expenditure of the Salt Department in all its Branches for the year 1911-1912, contrasted with those of the year 1910-1911.

Receipts.

Items.	1911-1912.	1910-1911.
SALT REVENUE.	**Rs. a. p.**	**Rs. a. p.**
IMPERIAL.		
Customs Duty on Salt—		
Import Duty by Sea	16,677 2 10	17,996 11 2
Do. by Land	3,45,366 12 7	3,59,437 11 3
Proceeds of Sale of Government Salt—		
Bárágrá Salt	5,88,652 9 7	5,87,819 1 1
Proprietary right of Government in Salt Works—		
Ground-rent at maundage rate	1,37,424 13 0	1,32,333 0 7
Ground-rent (Bulsár Salt)	18,053 6 11	17,113 7 0
Do. (Konkan Salt Works credited to Land Revenue)	249 3 5	410 15 5
Farms of Government Salt Works	45,837 0 0	46,726 0 0
Other Salt (cost price on salt supplied to fish-curers)	32,575 9 0	31,149 2 0
Excise Duty on Government Salt	.....	.....
Do. on Permits issued	1,19,33,069 10 0	1,10,04,640 12 0
Do. at nominal rates	11,985 10 0	13,672 4 6
Single and double duty (on excesses discovered on examination and by weighment at place of Import)	4,714 7 4	3,416 9 7
Fines and Forfeitures	1,049 15 8	1,168 12 8
Miscellaneous—		
Overtime Work Fees	16,908 12 0	18,551 12 0
Contribution from Port Funds towards cost of Coast-guard Establishment	10,000 0 0	10,000 0 0
Cost of Establishment recovered from Salt-farmers	2,663 8 5	2,557 11 3
Recovery of Salt Agents' Bagging and Sewing charges	1,28,595 0 1	81,119 2 3
Recovery of clothing charges	8,955 11 2	8,939 6 8
Other Items	12,654 13 11	10,512 4 5
Total, Imperial ...	1,33,15,434 1 11	1,22,97,569 11 10
PROVINCIAL.		
Sale-proceeds of forms, etc. (credited to XXIII —Stationery and Printing)	266 7 9	301 4 1
Grand Total, Salt Revenue ...	1,33,15,700 9 8	1,22,97,870 15 11

APPENDIX I—*continued.*

Expenditure.

Items.	1911-1912.			1910-1911.		
	Rs.	a.	p.	Rs.	a.	p.
SALT, IMPERIAL.						
Superior Supervising Establishment—						
Pay, including Exchange Compensation ...	1,34,231	12	8	1,32,694	1	8
Travelling Allowance	15,733	5	8	16,076	15	9
Tentage	1,846	8	5	1,962	12	1
Subordinate Establishment—						
Bonus Allowance	34,728	14	11	.....		
Pay, including Exchange Compensation Allowance	10,75,034	3	1	10,50,067	2	4
Plague Allowance	1,233	14	4	1,979	9	9
Travelling Allowance	58,014	7	1	56,212	2	10
House Rent Allowance	2,770	15	8	2,193	5	3
Horse Allowances	6,652	5	6	7,419	5	7
Grain Compensation Allowance	34,760	9	11	6	11	5
Local Allowance	10,420	5	9	9,625	6	4
Contingencies—						
Epidemic Charges	140	14	3	35	3	0
Service Stamps and Bearing Postage	10,684	2	6	10,356	2	0
Telegram Charges						
Law Charges	.....			1,175	0	0
Purchase of Books	272	7	0	35	0	0
Do. of Land and Compensation for Land	810	8	0	44,945	13	0
Do. of Tents	382	1	0	.....		
Do. of Boats	1,930	0	0	33,652	0	0
Rents	10,027	0	9	10,214	7	4
Rates and Taxes	2,443	12	6	1,482	10	7
Prizes for best Salt manufactured at Khárágoda	600	0	0	600	0	0
Clothing to Lascars	1,065	0	0	1,549	0	0
Boat Stores and Repairs	34,753	14	11	35,484	2	3
Rewards in Salt and Customs cases	3,880	6	10	1,775	1	7
Petty construction	62,152	10	6	75,516	12	11
Peons' clothing (Táluka Offices)	63,184	12	9	35,451	11	10
Arms and Accoutrements	313	11	1	1,864	15	6
Boat Allowance	16,834	6	1	16,896	8	11
Overtime Work Fees	18,258	6	3	18,221	15	2
Salt Purchase and Freight on account of Barágra Salt	4,52,289	8	10	4,50,876	8	6
Do. of removal of Salt to Fish-curing Yards	20,790	4	9	22,761	1	0
Cost of laying rails on the Udu salt Works ...	59,670	12	0	.....		
Khárágoda Dispensary Charges	152	3	4	58	0	6
Commission on Sale of Barágra Salt	15	10	0	15	10	0
Salt Agents' Bagging and Sewing Charges ...	1,06,117	0	1	72,486	3	3
Scales and Weights	1,661	14	7	3,942	2	0
Mapping charges	7	3	6	12	3	1
Supply of Medicines	1,300	5	8	497	10	9
Carriage of Tents and Records	3,103	0	3	2,914	12	6
Supply of Water	8,335	12	9	5,913	9	6
Peons' Uniforms and Belts (Huzúr Offices) ...	530	2	7	208	7	0
Petty Repairs	12,959	1	10	12,193	8	5
Petty Supply	6,344	0	1	5,940	8	8
Purchase of Carpets	791	15	0	310	5	6
Purchase of furniture	1,994	0	0	1,464	10	6
Purchase of Lead buttons	1,223	9	3	3,000	4	0
Remittance of Treasure	332	10	9	327	14	0
Conveyance of Confiscated Salt, etc.	12	0	9	6	15	0
Monsoon Weather Fences	10,316	9	3	10,021	1	9

APPENDIX I—*concluded.*

Expenditure—*continued.*

Items.	1911-1912.	1910-1911.
	Rs. a. p.	Rs. a. p.
SALT, IMPERIAL—*continued.*		
Contingencies—*continued.*		
Gam Kharach Allowances	1,096 13 0	959 14 11
Destruction of Salt	8 4 0	.....
Miscellaneous	624 14 3	507 14 2
Advertisement charges	825 15 0	190 6 8
Total, Salt ...	22,93,165 4 11	21,62,103 12 9
Deduct amount debitable to "4—Opium" as per Government Resolution, Revenue Department, No. 6639, dated 17th August 1905	440 9 11	798 5 2
	22,92,724 11 0	21,61,305 7 7
Deduct amount not subject to division—		
Expenditure of the Chief Account Office ...	58,189 6 11	57,388 9 4
Salt Purchase and Freight	4,73,079 13 7	4,73,637 9 6
Net amount	17,61,455 6 6	16,30,279 4 9
Deduct one-tenth debitable to Customs	1,76,145 8 8	1,63,027 14 10
Net nine-tenths debitable to Salt	15,85,309 13 10	14,67,251 5 11
Net debitable to Salt	21,16,579 2 4	19,98,277 8 9
Stationery and Printing	9,727 2 2	9,850 0 9
Excise duty on Salt refunded	47,988 8 0	53,376 8 1
GRAND TOTAL, SALT EXPENDITURE ...	21,74,294 12 6	20,61,504 1 7

APPENDIX J.

Statement showing Transactions, Credit and Cash, during the past three years.

	1909-1910.		1910-1911.		1911-1912.	
	Quantity.	Duty realizations.	Quantity.	Duty realizations.	Quantity.	Duty realizations.
	Mds. s. t.	Rs. a. p.	Mds. s. t.	Rs. a. p.	Mds. s. t.	Rs. a. p.
1. Quantity issued and duty recovered in cash during the year	99,62,970 0 0	99,62,970 0 0	98,30,869 15 0	98,30,839 6 0	1,07,12,547 30 0	1,07,12,547 12 0
2. Quantity issued on credit bonds during the year, but the duty on which remained to be recovered in the following year ...	7,56,677 35 0	.....	6,83,259 5 0	.....	6,71,958 0 0	.....
3. Quantity remaining unissued at the end of the preceding year and issued in the year, duty on which was realized and accounted for in that year	3,67,417 5 0	.....	6,12,898 10 0	.....	4,16,468 20 0	.....
4. Duty on quantity issued on credit bonds in the preceding year recovered in the year	.....	6,90,111 14 0	.....	7,56,677 14 0	.....	6,83,259 2 0
5. Duty realized in the year, but quantity not issued until after expiry of the year	.....	6,10,093 14 0	.....	4,12,786 4 0	.....	5,31,321 0 0
6. Duty realized for salt remaining unissued on credit bonds, duty having been realized in the year before issue	.....	3,260 4 0	.....	4,357 4 0	.....	5,941 12 0
Total ...	1,10,87,065 0 0	1,12,66,436 0 0	1,11,27,026 30 0	1,10,04,640 12 0	1,18,00,974 10 0	1,19,33,069 10 0

W. C. SHEPHERD,
Collector of Salt Revenue.

APPENDIX K.

Statement showing the operations of the Fish-curing Yards in the Bombay Presidency for the year 1911-1912.

No.	Name of Yard.	Year.	Quantity of Fish brought to be cured.	Quantity of Salt issued.	Quantity of Fish removed.	Percentage of Fish to each maund of Salt.	Expenditure including cost of construction, removal, &c., of Yards.	Receipts. Amount realized by sale of Salt.	Miscellaneous receipts.	Stock of Salt at the close of the year.	Value of Salt in Stock at the close of the year at cost price.	Total.
	Ratnágiri Range.		Mds. s.	Mds. s.	Mds. s.		Rs. a. p.	Rs. a. p.	Rs. a. p.	Mds. s.	Rs. a. p.	Rs. a. p.
1	Borla	1911-12	5,388 0	1,806 20	4,039 0	2·97	1,382 0 9	791 3 6	1 2 0	2,098 11½	913 0 0	1,710 5 6
		1910-11	3,035 0	1,011 0	2,306 10	3·	809 10 1	443 6 0	.....	1,035 20½	453 0 7	895 6 7
2	Jaigad	1911-12	13,013 20	4,004 20	9,010 5	2·27	2,568 13 0	1,751 15 6	.....	3,523 35	954 6 1	2,706 5 7
		1910-11	10,083 20	3,345 20	7,527 5	3·	1,923 15 1	1,325 13 6	.....	1,931 23	805 11 5	2,032 7 5
3	Waroda	1911-12	1,598 20	529 20	1,191 15	3·	543 11 8	231 10 6	0 14 0	881 20	251 5 11	483 14 5
		1910-11	793 0	264 0	595 35	3·	433 5 8	115 12 6	0 13 0	368 20	330 11 2	347 4 8
4	Kalbadevi	1911-12	4,261 10	1,421 0	3,192 25	2·99	1,473 14 6	621 11 0	0 7 0	1,085 3	438 13 2	1,060 15 2
		1910-11	3,936 25	1,310 0	2,949 0	3·05	986 15 5	576 8 6	0 5 0	491 0	122 12 0	699 9 6
5	Ratnágiri	1911-12	38,465 0	12,317 0	27,475 30	3·	4,899 7 2	5,388 11 0	1 12 0	3,733 30	1,013 8 2	6,402 15 2
		1910-11	32,178 5	10,454 20	24,165 34	3·	4,240 13 0	4,727 10 6	3 12 0	2,466 21	629 7 7	5,360 14 1
6	Purnagad	1911-12	2,661 0	887 0	1,993 30	3·	733 13 0	388 1 0	0 12 0	872 33	231 10 2	620 7 2
		1910-11	3,522 0	1,174 0	2,645 30	3·	662 12 1	513 10 0	1 12 0	650 18	159 3 7	674 0 7
7	Jaitápur	1911-12	10,281 0	3,427 0	7,695 35	3·	3,702 2 6	1,499 5 0	3 4 0	3,189 0	819 8 2	2,022 1 3
		1910-11	13,035 0	4,345 0	9,953 30	3·	2,254 8 11	2,268 1 0	1 13 0	2,776 38	654 11 6	2,924 0 6
8	Vizidurg	1911-12	7,975 20	2,673 0	5,982 35	2·99	1,656 5 1	1,169 7 11	1 1 0	1,027 12	403 12 1	1,634 5 0
		1910-11	10,047 0	3,349 0	7,534 15	3·	2,111 5 0	1,492 10 6	1 12 6	2,923 23	687 1 3	2,181 8 3
9	Mumbri	1911-12	3,646 20	1,215 20	2,734 35	3·	1,755 3 0	531 12 6	.....	916 10	413 15 0	945 12 3
		1910-11	2,787 0	929 0	2,090 10	3·	924 13 10	419 8 6	.....	1,201 18	525 10 2	945 2 8
10	Mitbaon	1911-12	2,853 0	951 0	2,139 25	3·	1,412 15 0	416 1 0	.....	1,562 22½	683 10 0	1,099 11 0
		1910-11	2,280 0	760 0	1,613 25	3·	938 14 11	333 8 6	.....	852 32	373 1 7	711 10 1
11	Sarjekot	1911-12	5,247 0	1,759 0	4,075 35	2·99	1,265 4 0	769 9 0	.....	904 7	394 9 3	1,165 2 3
		1910-11	3,574 20	1,191 20	2,680 35	3·	735 10 10	526 5 0	.....	654 33	286 7 9	813 12 9
12	Málwan	1911-12	16,615 20	4,921 0	12,444 30	3·38	3,693 10 11	2,153 15 0	.....	3,652 17	1,597 15 0	3,750 14 0
		1910-11	23,976 20	7,009 0	17,980 35	3·	3,933 1 2	3,293 7 0	.....	1,780 10	778 13 9	4,072 4 9
13	Devbág	1911-12	14,796 20	4,614 0	11,171 0	3·21	3,285 14 1	2,018 10 0	.....	2,411 30	1,055 2 3	3,073 12 3
		1910-11	12,735 0	4,245 0	9,481 20	3·	2,215 6 2	1,919 3 0	.....	1,392 25	609 4 5	2,528 7 5
14	Achra	1911-12	2,847 0	904 20	2,132 10	3·15	1,324 10 5	395 11 6	.....	1,516 23	676 2 10	1,071 14 4
		1910-11	1,615 20	538 20	1,213 35	3·	730 11 6	243 9 6	.....	1,479 23½	647 5 2	890 14 8
15	Kochra	1911-12	3,073 20	1,020 0	2,461 20	3·	708 7 6	446 4 0	.....	625 11	146 8 9	592 12 9
		1910-11	2,770 0	865 20	2,250 0	3·2	597 14 8	392 8 0	.....	479 5	112 4 3	504 13 3
16	Vengurla	1911-12	9,561 5	3,122 0	7,347 30	3·06	2,597 7 8	1,345 14 0	.....	3,730 27	888 7 0	2,254 5 0
		1910-11	7,147 20	2,296 20	5,489 34	3·11	2,405 8 10	1,028 14 6	.....	5,501 38	1,287 2 11	2,316 1 5
17	Shiroda	1911-12	4,215 20	1,402 0	3,143 0	3·	818 8 0	613 6 0	.....	1,110 36	289 3 5	903 9 5
		1910-11	759 0	253 0	570 0	3·	645 11 5	110 11 0	.....	1,057 38	247 15 4	358 10 4
	Total of the Ratnágiri Range.	1911-12	1,43,489 15	46,976 20	1,08,019 0	3·05	34,027 3 8	20,552 4 5	9 4 0	33,444 37½	10,936 10 0	31,498 2 5
		1910-11	1,34,228 10	43,531 5	1,01,028 33	3·09	21,791 8 4	19,936 2 6	10 3 6	27,593 25½	8,310 12 10	28,257 2 10
	Kánara Range.											
18	Majali	1911-12	7,109 21	2,054 20	5,532 23	3·5	901 0 6	898 13 6	15 12 0	1,147 13	234 13 5	1,149 6 11
		1910-11	4,232 26	940 0	3,411 9	4·5	501 1 4	413 7 0	6 0 0	837 13	170 5 1	589 12 1
19	Baitkhol	1911-12	9,145 5	2,961 0	7,086 11	3·2	1,889 1 0	1,251 11 0	2 4 0	2,040 37	407 1 11	1,661 0 11
		1910-11	6,134 3	1,961 20	4,991 15	3·12	1,077 5 6	859 3 6	16 8 0	2,610 26	520 12 5	1,396 7 11
20	Bingi	1911-12	1,435 0	427 20	1,036 20	3·4	225 6 4	187 0 6	.....	610 38	122 15 3	309 15 9
		1910-11	3,301 20	990 0	2,319 30	3·3	331 9 0	433 13 0	.....	464 2	93 6 4	527 3 4
21	Chendia	1911-12	3,489 6	1,050 0	2,646 8	3·3	552 6 0	459 5 0	.....	1,178 13	238 1 11	697 7 11
		1910-11	3,787 5	1,160 0	2,879 13	3·2	771 11 6	507 11 0	0 8 0	1,639 0	331 3 5	839 6 5
22	Kodar	1911-12	19,577 30	6,514 20	13,391 30	3·01	1,975 9 1	2,850 1 6	0 12 0	1,193 19	232 1 11	3,082 15 5
		1910-11	15,979 30	5,317 20	12,026 30	3·	1,355 14 8	2,326 8 0	12 0 0	1,716 32	350 15 4	2,689 7 4
23	Harwada	1911-12	15,020 20	3,548 0	11,185 30	4·2	1,085 11 6	1,552 4 0	.....	653 22	167 8 2	1,719 12 2
		1910-11	10,198 0	2,882 0	7,619 10	3·5	800 2 0	1,261 2 0	13 14 0	1,633 30	331 7 9	1,606 7 9
24	Keni	1911-12	7,296 10	1,593 20	5,848 15	4·6	1,054 14 6	697 2 6	.....	836 20	147 3 0	844 6 0
		1910-11	7,581 0	1,694 0	6,098 0	4·5	761 6 6	745 9 0	.....	1,244 0	544 4 0	1,289 13 0
25	Gangawally	1911-12	5,949 0	1,989 0	4,008 20	3·02	2,036 12 7	861 7 0	.....	3,800 18	1,688 15 2	2,550 6 2
		1910-11	9,257 0	1,942 0	7,804 10	4·7	2,221 5 11	870 7 6	.....	3,172 3	1,387 12 6	2,264 4 0
26	Tadri	1911-12	5,430 0	918 0	4,498 0	5·9	561 7 1	401 10 0	.....	8 12	3 10 1	405 4 1
		1910-11	3,787 0	669 0	3,117 20	5·6	355 11 4	297 5 6	.....	56 38	24 14 8	322 4 2
27	Kumta	1911-12	4,635 0	781 0	3,873 23	6·	922 15 4	341 11 0	.....	1,176 13½	257 0 0	599 1 0
		1910-11	7,815 35	1,347 0	6,370 10	5·8	1,044 1 9	597 1 0	.....	1,904 29½	501 15 9	1,099 0 9
28	Kaserkodej	1911-12	13,280 0	2,576 0	9,418 0	4·8	3,244 0 10	1,127 0 0	73 2 0	3,441 29	753 0 11	1,953 2 11
		1910-11	11,054 0	3,064 0	8,279 0	3·6	3,069 0 11	1,405 5 6	.....	6,006 19	1,578 9 3	2,983 14 9
29	Manki	1911-12	4,727 20	936 0	3,787 0	5·1	501 8 6	409 1 0	.....	1,543 19	337 9 0	746 10 0
		1910-11	7,534 0	1,478 20	6,044 32	5·07	1,196 3 11	676 4 0	.....	1,498 9	394 12 6	1,071 0 6
30	Murdeshwar	1911-12	3,713 20	776 20	2,934 35	3·5	284 2 4	339 11 6	.....	193 26	42 5 0	382 0 6
		1910-11	2,703 0	675 20	2,030 0	4·	349 13 7	295 11 0	.....	734 23	156 13 6	452 8 6
31	Bhatkal	1911-12	6,014 0	1,473 0	4,619 20	4·1	496 14 4	644 7 0	.....	913 4	199 12 0	844 3 0
		1910-11	8,694 20	1,116 0	2,979 10	3·3	716 11 0	513 7 6	.....	1,233 0	334 1 10	848 9 4
	Total of the Kánara Range.	1911-12	1,04,842 12	27,477 20	79,045 35	3·8	15,211 13 11	12,021 6 6	91 14 0	18,440 3	4,832 8 3	16,945 12 9
		1910-11	97,059 19	25,237 0	75,870 29	3·8	14,552 2 11	11,207 15 6	48 14 0	24,839 24	6,721 6 4	17,978 3 10
	Grand Total	1911-12	2,48,331 27	74,454 0	1,87,064 35	3·3	49,239 1 2	32,573 10 11	101 2 0	51,885 ¼	15,769 2 3	48,443 15 2
		1910-11	2,31,285 29	69,768 5	1,76,899 22	3·44	36,343 6 3	31,144 2 0	59 1 6	52,493 9½	15,032 3 2	46,236 6 8

	Rs. a. p.
Expenditure ...	49,239 1 2
Receipts ...	48,443 15 2
Loss ...	795 2 0

W. C. SHEPHERD,
Collector of Salt Revenue.

APPENDIX L.

Statement showing Details of Cases of Salt smuggling disposed of by the Salt Department during the year 1911-1912.

Divisions.	SALT.																			
	Nature of Offence.												Mode of Smuggling.							
	Theft from Salt-works.		Smuggling foreign Salt across Frontier.		Clandestine removal of Natural Salt.		Removals from Salt-works in excess of quantities specified in Permits.		Miscellaneous.		Total.		By Head-loads.		On Animals.		In Carts.		By Boats.	
	No.	Quantity.	No.	Quantity.	No.	Quantity.	No.	Quantity.	No.	Quantity.	No.	Quantity.	No.	Quantity.	No.	Quantity.	No.	Quantity.	No.	Quantity.
		Mds. s. t.		Mds. s. t.		Mds. s. t.		Mds. s. t.		Mds. s. t.		Mds. s. t.		Mds. s. t.		Mds. s. t.		Mds. s. t.		Mds. s. t.
Northern Division.	1	0 1 17	...	.....	6	1 11 67½	...	...	...	.....	7	1 13 4½	2	0 4 40	...	...	2	0 11 0	...	...
Daman Frontier ...	...	...	2	13 5 40	...	...	...	...	1	0 12 0	3	13 17 40	2	13 5 40	...	...	...	...	...	...
Total, N. D and Daman ...	1	0 1 17	2	13 5 40	6	1 11 67½	...	...	1	0 12 0	10	14 30 44½	4	13 10 0	...	...	2	0 11 0	...	...
Southern Division.	14	21 39 56½	1	1 25 0	24	9 12 20	...	...	33	52 25 0	72	85 21 76½	25	13 7 60	...	...	4	27 29 20	3	10 0 40
Goa Territory ...	...	...	23	17 28 53	...	...	...	...	...	.....	23	17 28 53	14	11 28 25	...	...	1	0 4 0	...	...
Total, S. D. and Goa ...	14	21 39 56½	24	19 13 53	24	9 12 20	...	...	33	52 25 0	95	103 10 49½	39	29 36 5	...	...	5	27 33 20	3	10 0 40
Total ...	15	22 0 73½	26	32 19 13	30	10 24 7½	...	...	34	52 37 0	105	118 1 14	43	43 6 5	...	...	7	28 4 20	3	10 0 40

Divisions.	SALT—*contd.*														
	Mode of Smuggling—*contd.*				How cases were disposed of.										
	Miscellaneous.		Total.		Number of persons arrested.	Number of persons released by the Department.	Number of persons prosecuted.	Number of persons convicted.	Number of persons acquitted.	Percentage of convictions on number prosecuted.	Total estimated value of Confiscations.	Fine in lieu of confiscated Property released.	Actual produce by auction-sale of confiscated Property.	Total of two previous columns.	Fines imposed by Magistrates.	Real value of confiscated Property.	Rewards granted, if any.
	No.	Quantity.	No.	Quantity.													
		Mds. s. t.		Mds. s. t.							Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
Northern Division.	3	0 37 44½	7	1 13 4½	7	...	7	5	2	71·43	0 1 1	.....	.....	.....	33 4 0	0 1 1	14 2 0
Daman Frontier ..	1	0 12 0	3	13 17 40	4	...	4	4	...	100·00	40 0 3	.....	0 5 6	0 5 6	15 0 0	40 0 3	51 8 0
Total, N. D. and Daman ...	4	1 9 44½	10	14 30 44½	11	...	11	9	2	81·82	40 1 4	.....	0 5 6	0 5 6	53 4 0	40 1 4	65 10 0
Southern Division.	40	29 24 36½	72	85 21 76½	87	12	75	74	1	98·67	3,595 12 6	146 0 0	21 1 4	167 1 4	329 14 0	2,989 13 11	323 4 0
Goa Territory ...	8	5 36 28	23	17 28 53	20	3	17	16	1	94·12	104 5 3½	.....	77 13 0	77 13 0	54 8 0	43 3 3½	72 8 0
Total, S. D. and Goa ...	48	35 20 64½	95	103 10 49½	107	15	92	90	2	97·83	3,700 1 9½	146 0 0	98 14 4	244 14 4	384 6 0	3,032 15 2½	395 12 0
Total ...	52	36 30 20	105	118 1 14	118	15	103	99	4	96·13	3,740 3 1½	146 0 0	99 3 10	245 3 10	437 10 0	3,073 0 6½	461 6 0

W. C. SHEPHERD,
Collector of Salt Revenue.

No. 6424 of 1912.

Camp Poona, 30th August 1912.

Submitted to Government in the Revenue Department.

2. The financial results of the year under report and the two previous years are as follows :— Financial Results.

	1911-12.	1910-11.	1909-10.	Annual average. 1904—1909.
	Rs.	Rs.	Rs.	Rs.
Gross receipts	133 lákhs.	123 lákhs.	126 lákhs.	150 lákhs.
Net receipts	111·4 „	102·5 „	107 „	132 „
Expenditure exclusive of refunds .	21·25 „	20 „	18·75 „	17·5 „
Percentage of charges to net receipts	19	19·6	17·5	13·3

3. The salt removed from the works amounted to— Removals.

	Full duty.	Nominal duty.	Free of duty.	Total.
	Mds. s.	Mds. s.	Mds. s.	Mds. s.
1910-11	11,127,026 30	869,408 0	118,081 39	12,114,516 29
1911-12	11,800,974 10	759,310 0	87,443 10	12,647,727 20

from which it will be seen that there was an increase of about 6¾ lákhs maunds or 6 per cent. in the removals of salt at full duty. There was, however, a considerable falling off in the removals of salt on which nominal duty was payable and salt which was free of duty. This falling off is probably the natural consequence of the unusually large removals in 1910-11.

4. The total quantity manufactured rose from 13,022,890 maunds to 13,294,143 maunds, and though the production increased by about 2¾ lákhs maunds or 2 per cent., the aggregate stocks in hand fell from 28½ lákhs at the beginning to 26¾ lákhs at the close of the year. This stock, added to the balance of 74 lákhs on the 30th June 1912 (against 58¾ lákhs on the same date in the previous year), is more than sufficient to meet the ordinary demand up to the next manufacturing season. The amount produced within the financial year 1911-12 is not very appreciably larger than usual but the fact that 118 lákhs were actually turned out during the full manufacturing season, that is, from October 1911 to the end of May 1912, makes it clear that for the present and for some years to come there is no danger of the margin of supply becoming too narrow, and the Commissioner has therefore recommended to Government that the proposed construction of new salt-works at Bhándup should be postponed till such time as there appears some indication that the demand has begun to gain permanently and progressively on the supply. The outturn of Bárágrá salt at present is just sufficient to meet annual demands. To provide for any further increase in the demand for that salt, the proposed new salt-work between Khárághoda and Udu should be opened as soon as possible. A scheme has already been laid before Government and their orders are awaited. Manufacture.

5. The increase in the removals of fully dutiable salt is accompanied by more than the corresponding rise in the excise duty receipts due to larger advance payments for next year's removals. There was an increase in the quantity of salt exported to all parts outside the Presidency except Calcutta and Foreign Malabár, at both of which places a decrease of over a lákh of Receipts

maunds is noticeable. In the case of the former the falling off is attributed to larger imports from Liverpool and in the latter to the unusually extensive removals in 1910-11. During the year 1910-11, 73·3 per cent. of the salt produced in salt-works near Bombay was exported outside the Presidency. The proportion fell to 72·6 in the year under report.

Expenditure.

6. The total expenditure of the Department for reasons stated in paragraph 45 of the report has increased during the year by 1¼ lákhs. Most of the items which contribute to the increase are non-recurring. Expenditure has been steadily rising for some years—there is an increase of nearly 27 per cent. since 1904—and the Commissioner proposes to make a careful examination of the charges with a view to ascertaining how far this increase is inevitable.

Offences.

7. There was again a fall in the number of cases of salt smuggling which decreased from 135 to 105.

Fish-curing Yards.

8. The working of the fish-curing yards shows a net loss of Rs. 795 against a profit of Rs. 9,892 in the previous year. The loss is noticeable in the Ratnágiri District and may be attributed partly to the unfavourable fishing season and partly to the reduction in the cost price of salt issued to fish-curers. The reduction in the issue rate from 8 annas to 7 annas per maund to encourage the fishing industry was brought into force from 1st October 1910, and the result will have to be watched for some years before any proposal for the restoration of the old rate can be considered. The question of the proposed improvement of the existing fish-curing yards is still under consideration. The concession of issuing salt at yard rates for curing fish at sea was allowed during the year, but the report furnishes evidence of the unwillingness of the fish-curers to avail themselves of it.

Consumption and Prices.

9. The average rate of consumption per head throughout the Presidency (calculated on the census figures of 1911) rose from 12·5 lbs. to 13·2 lbs., while the average selling price in most of the districts of the Presidency was either lower than that of the previous year or stationary. The slight rise in the districts of West Khándesh, Sátára, Ahmednagar, Dhárwár and Bijápur is attributed to the rise in the price of gunny bags. In the case of Belgaum it was also partly due to an increase in the railway freight. The fall of about 6 annas in the price at Ratnágiri was due to the newly introduced practice of issuing salt for domestic consumption from the fish-curing yards during the monsoon.

Concluding Remarks.

10. Mr. Enthoven was in charge of the Department for the greater part of the year which, as the report shows, has been marked by several satisfactory features such as increased production and consumption and a slight reduction in retail price.

H. O. QUIN,

Commissioner of Customs,
Salt, Opium and A'bkári.

ADMINISTRATION REPORT

OF THE

SALT DEPARTMENT IN SIND

FOR

1911-1912.

Prepared in the office of the Assistant Commissioner of Salt, Excise and Opium in Sind, Karachi.

17



BY AUTHORITY.

KARACHI:
THE COMMISSIONER'S PRINTING PRESS,
1912.

No. C-523 of 1912.

Revenue Department.

Office of the Commissioner in Sind.

Government House, Karachi, 5th August 1912.

Memorandum.

The Commissioner in Sind has the honour to submit the report of the Assistant Commissioner, Salt, Excise and Opium in Sind, on the administration of the Sind Salt Department for the year 1911-12.

2. The average rate of consumption of salt in the province rose from 9·81 to 10·59 per head per annum and the average selling price fell from Rs. 1-14-9 to Rs. 1-14-6 per maund. The net receipts rose from Rs. 3,70,070 to Rs. 4,18,487 and the net expenditure fell from Rs. 92,555 to Rs. 87,742.

3. Owing to the general rise in the price of labour the Commissioner found it necessary to raise the contract rate for the storage of salt from 2½ pies to 3 pies per maund with effect from the 1st November last. It was not necessary to make a corresponding increase in the issue rate of salt as the latter rate already included a charge at the enhanced storage rate.

4. The insufficiency of the fresh water supply at Maurypur continued to be a source of hardship to the Government staff and the salt workers; but the inconvenience has to some extent been removed by the entertainment of an additional water carrier. After careful consideration of the whole question and of the estimates of cost of the alternative schemes which have been suggested the Commissioner has come to the conclusion that the most satisfactory and economical solution of the difficulty is to arrange for a supply of water from the Municipal water works. The Municipality are at present unable to spare any water or even to guarantee a supply in the future, but the question will be examined again when the present extension of the Karachi water works is completed.

5. The desirability of providing a medical dispensary at Maurypur is undeniable and has been commented on in several previous reports. The Assistant Commissioner is being instructed to take up the question separately in consultation with the Collector of Karachi and the medical authorities.

6. Mr. Phillipowsky has submitted an interesting report which shows that the results of the year's working of the department have been satisfactory.

W. H. LUCAS,
Commissioner in Sind.

To

The Chief Secretary to Government,
Revenue Department, Bombay.

INDEX

TO

The Administration Report of the Salt Department in Sind for 1911-1912.

Subject.	Page.
I.—General financial results—	
Revenue	1—2
Expenditure	2
II.—Local production, imports and disposals—	
Consumption of salt	2—3
III.—Selling prices	3
IV.—Fish-curing operations	3—4
V.—General remarks	4—6

Note.—Six pages have been prescribed as the maximum limit of the text of the report, *vide* Government of India letter No. 6511-S.-R., dated the 28th December 1900, printed as an accompaniment to Bombay Government Resolution, Revenue Department, No. 284, dated the 15th January 1901.

No. G-1219 OF 1912-13.

GENERAL DEPARTMENT.

Office of the Assistant Commissioner of Salt,
Excise and Opium in Sind.

Karachi, 19th July 1912.

FROM

P. PHILLIPOWSKY, ESQUIRE,
Assistant Commissioner of Salt,
Excise and Opium in Sind,

TO

THE COMMISSIONER IN SIND.

SIR,

I have the honour to submit the Annual Report on the Administration of the Salt Department in Sind for the official year 1911-1912.

Mr. G. Barker was in charge of the department upto the forenoon of the 29th September 1911, when I returned from six months' combined leave and took charge.

1.—GENERAL FINANCIAL RESULTS.

Revenue.

2. The gross receipts during the past five years are contrasted below :—

	Rs.
1907-1908	4,86,592
1908-1909	4,79,031
1909-1910	4,84,401
1910-1911	4,96,902
1911-1912	5,43,748

Appendix II. Details of receipts during 1911-12 are given in the attached statement No. II.

3. Excise Duty showed a total increase of Rs. 45,657-3-7 as under, as compared with the preceding year :—

On local salt	Rs.	37,157	1 2
On Punjab salt imported by private agency	„	8,500	2 5
Total increase ...	Rs.	45,657	3 7

Customs duty on European salt imported by sea showed a decrease of Rs. 385-14-0.

4. Under "Miscellaneous Receipts" comprising recoveries on account of manufacturing, storage, establishment, bagging, conveyance and railway freight etc., there was an increase of Rs. 1,575-5-3. The increase is noticeable in all the items, except in sale proceeds, which item is of a fluctuating nature, and in bagging, conveyance and railway freight, which charges are recovered exclusively on salt issued from the Sukkur salt depôt where there had been a decrease in the sales

during the year under report. The increase in the other items is due to the increase in the sales of salt at the other centres of issue, specially the Maurypur Salt Works. "Miscellaneous Revenue" represents recoveries of a fee of Rs. 100 from firms who were granted concession of the right to use salt free of duty for industrial purposes, to cover the cost of supervision and incidental expenditure. The increase is due to two more firms having been granted the concession this year.

5. The total expenditure amounted to Rs. 1,78,330-10-6 against Rs. 1,79,174-7-3 during the preceding year, as detailed in the attached statement No. II. The percentage of charges to gross receipts is 32·8 against 36·06 in the preceding year. If, however, the percentage be calculated after deducting the recoverable items, such as manufacture, storage, bagging, conveyance and freight from both the Revenue and Expenditure, the figures will be 25·6 against 25·22 in the year 1910-11.

6. The net financial results according to the bases of supply are shewn in the subjoined table.

Places of sale.	Gross Receipts.			Expenditure.			Net Receipts.		
	Rs.	a.	p.	Rs.	a.	p.	Rs.	a.	p.
Maurypur	3,61,237	9	9	55,308	11	10	3,05,928	13	11
Sukkur	74,713	10	0	22,524	3	8	52,189	6	4
Saran	32,911	7	9	3,370	4	10	29,541	2	11
Dilyar	35,740	10	0	6,039	5	6	29,701	4	6
Shamspir	1,626	0	0	499	8	0	1,126	8	0
Total Rs. ...	5,06,229	5	6	87,742	1	10	4,18,487	3	8

II.—Local Production, Imports and Disposals.

7. Statement No. III attached compares the quantity of salt manufactured in Sind and imported by land and sea during the year under report with the preceding year. The sources of supply remained unchanged. The closing balance of 1,62,432 Indian maunds at Maurypur, which shows an increase of 32,179 maunds on the closing balance of the previous year, is obtained after deducting 48,720 Indian maunds despatched to the Sukkur Salt Depôt for storage and sale there, and 1,500 maunds supplied to the Shamspir Salting Station for fish-curing purposes. The total loss by wastage amounted to 22,567 against 11,367 maunds in the year 1910-11. The difference is chiefly noticeable in the figures of the Maurypur Salt Works where loss by wastage was 20,602 maunds, against 8,691 in the year 1910-11 and is due to natural causes.

8. The quantities of salt sold during the past five years are shewn in the subjoined comparative statement.

District.	1907-08.	1908-09.	1909-10.	1910-11.	1911-12.	Increase.	Decrease.
	Maunds.	Maunds.	Maunds.	Maunds.	Maunds.	Increase.	Decrease.
Karachi ...	254,788	237,431	269,983	285,520	323,604	38,084	...
Sukkur ...	76,482	84,920	71,958	60,128	46,424	...	13,704
Thar and Parkar ...	56,267	51,541	48,480	47,301	61,271	13,970	...
Total ...	387,537	373,892	390,421	392,949	431,299	52,054	13,704
				Deduct decrease ...		13,704	
				Net increase ...		38,350	

9. The Karachi sales are all from the Maurypur Salt Works, and include 1,626 Indian maunds of salt consumed at the Shamspir Salting Station for fish-

curing purposes. Those shewn against Sukkur are from the Sukkur Salt Depôt, which is supplied from Maurypur, while the sales in the Thar and Parkar district are from the Saran and Dilyar Salt Depôts in that district.

10. The salt supplied to His Highness the Mir of Khairpur, *i. e.* 15,456 Indian maunds as shewn in statement No. III is free of Excise duty. The quantity indented for by His Highness exhibited a further decrease of 672 maunds during the year under report, the quantity indented for during 1909-10 and 1910-11 being 18,480 and 16,128 maunds respectively.

11. The total quantity of licit salt consumed in the Province, including table salt and Punjab rock salt imported by private agency, amounted to 465,328 Indian maunds as shewn below, against 418,945 Indian maunds in the year 1910-11.

	Indian Maunds.
Sind salt...	431,299
Punjab salt	32,176
Table salt	1,953
Total ...	465,328

12. Taking the population at 3,513,435 souls, according to the census of 1911, the average rate of consumption per head per annum comes to 10·59 lbs. against 9·81 lbs. during the previous year. The sales at Maurypur show an increase of 37,672 maunds, while those at Sukkur exhibit a decrease of 13,704 maunds, which is due to the continued existence of the private depôt at Shikarpur mentioned in last year's report. The Superintendent of the Sukkur Salt Depôt in this connection reports that the sales of the year 1911-12 will continue at the same figure in the future, as the private depôt referred to above was in existence throughout the year. It is, however, believed that when unfavourable weather conditions prevail in Sind, and breaches occur on the railway line, this private depôt will cease to exist, and the sales of salt from the Sukkur Salt Depôt will again go up. The sales at Maurypur, which are the highest on record, have almost doubled themselves during the past decade, the sales in 1902-03 and 1911-12 being 1,61,740 maunds and 3,21,978 maunds respectively. The increase in the sales of Saran Salt at the salt Depôt is attributable to the failure of the monsoon in the desert, in consequence of which the people instead of attending to cultivation as usual, had recourse to the salt trade. The increase of sales at the Dilyar Salt Depôt is due to competition amongst the camel owners who provide the conveyance for carrying salt, of which the salt traders took full advantage.

III.—Selling Prices.

13. The selling prices of salt at the Government Depôts continued the same as in the previous year, viz :—

	Rs.	a.	p.
Maurypur Salt Works	1	2	0
Sukkur Salt Depôt	1	9	9
Saran Salt Deposit	1	1	6
Dilyar Salt Depôt	1	2	3

14. The wholesale and retail prices of salt in all the talukas in the province, as reported by the District officers, are given in statement IV attached. The average for the whole province works out at Rs. 1-14-6, against Rs. 1-14-9 in the year 1910-11, which is very satisfactory.

Appendix IV.

IV.—Fish-curing Operations.

15. There was only one Government enclosure for fish-curing purposes *viz* : at Shamspir. Salt was issued there at the rate of one rupee per maund throughout the year. The dried fish salted at this yard is exported as usual, to Bombay, Rangoon, Colombo, Mombasa and Zanzibar. This yard is mostly used from the end of March to the middle of June. The fishing season was a favourable one.

during the year under report. The quantity of salt issued for fish-curing purposes was 1,626 maunds, shewing an increase of 412 maunds. The number of fish cured was 65,720 weighing 7,087 maunds and 23 seers, against 27,974 weighing 5,216 maunds in the previous year. The expenditure at Shamspir amounted to Rs. 499-8-0 against Rs. 488-12-0 in 1910-11.

V.—General Remarks.

16. During the year under report 65 offences against the salt laws were detected, against 39 in the preceding year, details of which are given in statement V attached. The Karachi district shows an increase of 27 cases, but almost all were petty cases and were detected in the Tatta and Shah Bandar divisions. In the Sukkur district no case was detected in 1910-11, but during the year under report 11 cases were detected. The seizures were all made in the Rohri division for which the Inspector and his sowar, Dinmahomed Panyalkhan deserve credit. The cases detected in the Larkana and the Upper Sind Frontier districts were fewer than those in the year 1910-11, while the variations in the figures of the Hyderabad and the Thar and Parkar districts were slight.

Appendix V.

17. Details of the total sanctioned number of appointments including the preventive force, are given in statement I. The Reri Salting Station which was under this department, was transferred to the Customs Department during the early part of the year. The establishment of this office was revised, G. R., R. D., No. 11175, dated the 8th December 1910, but the revision came into force from 1st April 1911. After a full year's working with the increased establishment of 7 clerks, I find that the work which has been assigned to my office by the rules regarding the relations of this department with the District officers, is so large, that even with the present staff I can hardly cope with it, and it is only by working early and late that the work is brought up to date. The rush of work is primarily in the Financial branch of my office for which there are only two clerks, and I have frequently found it necessary to detach one or more clerks of other Branches *viz.*, the Abkari and General to assist the Financial branch in their duties. The necessity of two additional clerks is keenly felt, but this as well as the question of increasing the pay of the Head Clerk which is considerably low, will form the subject of a separate reference.

Appendix I.

18. The Sukkur and the Dilyar Salt Depôts were inspected by me, and the Saran Salt Deposit by the Superintendent of Salt, Excise and Opium in Sind. The usual test weighments were made with satisfactory results. I performed a regular winter tour during the year under report visiting mostly such portions of the Karachi, Hyderabad, Larkana, Sukkur and Upper Sind Frontier districts as were not visited by me during the preceding year.

19. Statement VI, attached, shows in a contrasted form the receipts on account of fresh water fishery farms for the past five years from which it would appear that the fishing season was an average one.

Appendix VI.

20. The advantages offered by the Indian Salt Duties Act have not as yet been availed of by any of the salt merchants of Sind, neither has the concession of paying duty etc., on account of through Traffic Salt into the Post Offices been availed of by any of the salt traders in Sind.

21. The John Forstner Co., Messrs. David Sassoon & Co., Messrs. Allidina Allimahomed & Co., and Mr. Bundally Kassim hide and skin-curers of Karachi held concessions of the right to use salt free of duty for industrial purposes. A fee of Rs. 100 is payable annually by each firm, to cover the cost of supervision and incidental expenditure. Rebates of duty amounting to Rs. 1,592 against Rs. 2,150 in the preceding year, were paid to the above firms. The decrease is chiefly due to the failure of the firm of Mr. John Forstner, the first concessionaire, who carried on a fairly large business in wet skins and used a large quantity of salt. The tanneries are frequently visited by me when at Head-Quarters.

22. The storage charges of salt at the Maurypur Salt Works were raised from Rs. 1-5-0 to Rs. 1-9-0 per 100 maunds with effect from 1st November 1911,

under the orders of the Commissioner in Sind conveyed in his No. C-664, dated the 22nd and 23rd November 1911, in view of scarcity and dearness of labour. This is a recovering charge, and while the storage contractors were being paid at Rs. 1-5-0 per 100 maunds or 2½ pies per maund, the charge was recovered from the public at Rs. 1-9-0 per 100 maunds or 3 pies per maund.

23. The weighment and consignment of salt from the Maurypur Salt Works to the Sukkur Salt Depôt, the Khairpur State, and the Shamspir Salting Station, was as usual, made departmentally through a contractor. For many years, and throughout the first portion of this year, the North Western Railway authorities regularly provided this department with a waggon of 18½ tons capacity for the consignment of Government salt to Sukkur, but during the latter portion of the year they expressed there inability to do so, and requested that the consignments should be regulated to suit the waggons available. Their refusal has caused considerable trouble and inconvenience, as it is found impossible, with the Maurypur Salt Works situated a distance of 7 miles from Karachi, to arrange consignments to suit the tonnage of waggons which may be placed at the disposal of the department on any given day. It is also found impossible to convey the consignments of salt for these large waggons to the station on the same day, in consequence of which delays take place, which causes serious hinderance to the work of the department. The Railway authorities are again being addressed with a view to arrangements being made to revert to the old practice of supplying waggons of 18½ tons capacity to this department.

24. With the exception of one imported case of plague which proved fatal during the early part of the year, the Maurypur village has remained free from epidemics of all kinds, and the health of the inhabitants was good. The sanitation of the works and village was as good as could be desired, a sweeper being employed by the Lunaris for the sanitation of the village.

25. The permanent buildings at the Salt Works and Depôts were looked after and kept in repairs by the Pubic Works Department. The work of constructing landhis for the Excise Inspectors, Dafedars and Sowars is progressing.

26. The School opened at Maurypur by the Municipality is progressing favourably. An innovation in the management of the school has recently been introduced at the request of the Chief Officer and Secretary, School Board, Karachi Municipality, by the formation of a school committee, consisting of the Superintendent and Inspector, Maurypur Salt Works, (for the time being) ex-officio, and two Lunaris.

27. The want of a dispensary at the Maurypur Salt Works has been commented upon in previous administration reports. There is a spare room in the Maurypur office building, which could easily, with slight alterations, and at a small cost, be filled up for the purposes of a dispensary. If arrangements could be made for an itinerary Sub-Assistant Surgeon to visit Maurypur once a week, it would confer a great boon on the Government establishment stationed there, as well as on the resident population. The supply of fresh water to this important Salt Works is another urgent want and the matter is being kept in sight, in view of the remarks made by the Commissioner in Sind in his endorsement to Government No. C-565, dated the 30th September 1911, and the fact that the additions to the Municipal Water Works referred to therein are approaching completion.

28. At Maurypur very little in the way of statistics is available to guide officers as to the best methods of treating brine in the pans, so as to obtain a good outturn and the best quality of salt. The pans on the whole yield a good outturn of salt and the salt manufacturers are mostly Makranis. The number of Pardesi and Bania lunaris is very small. Although the Makranis are a half civilised and rough lot they are accustomed to this work, and on the whole make very good lunaris. I am desirous of finding out whether or not the present methods of treating brine at the Maurypur Salt Works admit of any improvement, and am therefore introducing registers in which will be recorded all information regarding the history of some selected pans during the manufacturing season, such for

instance as the dates of first filling and each replenishment, the depth of brine after the last filling, the density and depth at the time of extraction, the climatic conditions, the quantity and quality of the salt produced, etc. These registers will not only be interesting, but should prove of value in practical salt manufacture.

29. The conduct of the establishment has been upon the whole good. Mr. Khemchand Dialmal, Superintendent of the combined Salt, Excise and Opium Department in Sind, has continued to render useful help in supervising the work of the Preventive Force. Mr. W. G. Rozare, Superintendent, Maurypur Salt Works, continued to give satisfaction in the management of these important works, and Messrs. Gulrajmal Metharam, and Metharam Dalsing, Superintendents of the Sukkur and Dilyar Salt Depôts, conducted their duties satisfactorily. Mr. Bherumal Mahirchand the Head Clerk of my office has continued to discharge his important duties to my entire satisfaction.

I have the honour to be,

Sir,

Your most obedient servant,

P. PHILLIPOWSKY,

Assistant Commissioner of Salt,
Excise and Opium in Sind.

STATEMENT No. I.

(*See* paragraph .)

Showing the sanctioned strength of establishment for the Sind Salt Department.

Designation.	Rs. 500 —30— 800.	Rs. 200 —20— 300.	Rs. 250.	Rs. 175.	Rs. 150.	Rs. 125.	Rs. 100.	Rs. 92.	Rs. 75.	Rs. 60.	Rs. 50.	Rs. 45.	Rs. 40.	Rs. 35	Rs. 30	Rs. 25	Rs. 11 to Rs. 20.	Rs. 10 and under.	Total.
Assistant Commissioner of Salt, Excise and Opium in Sind.	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Superintendents ...	...	1	1	...	...	...	1	1	...	1	...	...	...	...	...	...	...	...	5
Inspectors	...	...	...	2	2	3	4	...	4	...	1	...	...	..	...	...	...	...	16
English writers (clerks).	...	...	...	...	...	...	..	...	...	2	...	2	5	3	4	3	...	...	19
Dafedars	...	...	...	...	...	...	...	...	...	...	...	...	...	13	...	...	...	...	13
Sowars	..	...	..	...	...	...	...	...	...	...	...	...	...	...	75	...	...	...	75
Amaldars (Havaldars and Naiks).	...	...	...	...	...	...	...	...	...	..	...	...	...	...	...	20	...	20	
Peons	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	98	98
Pumpman	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	1
Bhistis	...	...	...	...	...	...	...	..	...	...	...	...	...	...	...	...	...	2	2
Sweepers	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	1
Total ...	1	1	1	2	2	3	5	1	4	3	1	2	5	16	79	3	22	100	251

Note.—This statement excludes Opium Inspectors, Abkari, Bonded Warehouse, Intoxicating Drugs Warehouse, and Distillery Inspectors' establishments.

P. PHILLIPOWSKY,
Assistant Commissioner of Salt,
Excise and Opium in Sind.

Karachi, 19*th July* 1912.

STATEMENT No. II.

Showing receipts and expenditure of the Salt Department in Sind for the year 1911-1912, contrasted with the year 1910-1911.

No.	Items.	1910-1911. Rs. a. p.	1911-1912. Rs. a. p.
	RECEIPTS.		
	IMPERIAL REVENUE.		
1	Excise duty on locally made salt ...	3,93,415 6 10	4,30,572 8 0
2	Do. payable Salt imported by land ...	23,675 13 7	32,176 0 0
3	Customs duty on European salt imported by sea	2,339 6 0	1,953 8 0
4	Manufacturing charges recovered...	24,866 4 0	29,920 2 6
5	Storage do. ...	8,144 0 6	9,861 14 9
6	Establishment do. ...	16,672 14 6	17,493 10 0
7	Bagging do. ...	936 6 0	725 6 0
8	Conveyance do. ...	5,941 14 0	4,834 6 0
9	Railway freight do. ...	20,600 4 0	15,958 4 0
10	Sale-proceeds of unserviceable dead stock articles ...	209 5 3	2 10 3
11	Miscellaneous	100 0 0	250 0 0
	TOTAL ...	4,96,901 10 8	5,43,748 5 6
	EXPENDITURE.		
	IMPERIAL REVENUE.		
	Superior supervising establishment.		
1	Pay to the Assistant Commissioner of Salt, Excise and Opium in Sind.	6,720 0 0	8,446 9 9
2	Travelling allowance to do. ...	2,111 3 8	1,993 15 0
3	Tentage to do. ...	300 0 0	300 0 0
	Subordinate establishment.		
4	Pay	78,242 4 8	82,475 1 7
5	Bonus	.....	1,992 8 0
6	Local allowance	.....	853 14 5
7	Plague allowance	.....	8 2 8
8	Grain compensation allowance ...	202 15 7	578 5 0
9	Travelling allowance	7,185 0 1	5,375 14 8
10	Office rent	853 11 5	929 7 0
11	House-tax	7 6 5	6 15 4
12	Petty supply allowances ...	5,282 5 4	4,263 1 2
13	Postage and bearing charges ...	1,043 9 6	1,449 11 6
14	Purchase and repairs of dead stock articles	899 12 0	1,680 3 3

No.	Items.	1910-1911.	1911-1912.
	EXPENDITURE—*continued.*		
	IMPERIAL REVENUE—*continued.*	Rs. a. p.	Rs. a. p.
	Subordinate establishment—contd.		
15	Water-supply	282 0 0	284 13 9
16	Clothing to peons	232 12 0	476 9 0
17	Payment to salt makers ...	30,669 2 1	32,515 0 1
18	Storage of salt	8,193 0 0	5,862 3 9
19	Test weighments	12 5 0	11 13 0
20	Conveyance of salt	5,699 0 0	4,252 8 0
21	Railway freight on salt ...	24,424 10 0	16,185 10 0
22	Petty construction and repairs ...	1,092 10 0	3,045 0 0
23	Carriage of tents and records ...	372 8 2	386 3 4
24	Thatching of salt heaps ...	582 8 0	982 13 0
25	Rewards to informers ...	861 8 0	1,965 4 7
26	Purchase of gunny bags	1,110 0 0	.....
27	Hot weather establishment ...	53 1 1	67 7 11
28	Refunds	2,150 0 0	692 0 0
29	Conservancy charges	205 8 3	303 5 10
30	Construction and repairs of storage platforms	97 4 6	900 13 11
	Temporary establishment.		
31	Pay to clerks Khalasis and etc. ...	281 6 6	32 0 0
32	Travelling allowance to do. ...	6 15 0	13 3 0
	TOTAL ...	1,79,174 7 3	1,78,330 10 6

P. PHILLIPOWSKY,
Assistant Commissioner of Salt,
Excise and Opium in Sind.

Karachi, 19*th July* 1912.

STATEMENT No. III.

(*See* paragraph .)

Contrasted statement showing the local operations and details of salt imported into the province during the years 1910-1911 and 1911-1912.

Sources of supply.	Year.	Receipts.			Issues.					Importations.	
										By land.	By sea.
		Opening balance.	Salt manufactured or excavated.	Other receipts.	Salt sold.	Issued to H.H. the Mir of the Khairpur State.	Other issues.	Loss by wastage.	Closing balance.	Quantity.	Quantity.
		Mds.	Mds.	Mds.	Mds.	Mds.	Mds.	Mds.	Mds.	Mds. srs. t.	Mds. srs. t.
Maurypur Salt Works.	1911-1912.	130,253	440,425	...	321,976	15,456	50,220	20,602	163,423		
	1910-1911.	112,240	398,562	...	284,306	16,128	71,424	8,691	130,253		
Sukkur Salt Depôt	1911-1912.	23,700	...	48,295	46,424	...	...	352	25,219		
	1910-1911.	14,767	...	69,516	60,128	...	...	455	23,700		
Saran Salt Depôt	1911-1912.	11,871	39,980	...	30,080	...	...	1,120	20,651		
	1910-1911.	30,153	7,500	...	26,037	...	...	1,744	11,871		
Dilyar Salt Depôt	1911-1912.	13,020	37,620	...	31,191	...	...	493	18,956		
	1910-1911.	7,525	29,236	...	23,264	...	...	477	13,020		
Sharaspir Salting Station.	1911-1912.	411	...	1,500	1,626	...	...	...	285		
	1910-1911.	425	...	1,200	1,214	...	...	...	411		
Total ...	1911-1912.	179,255	518,025	49,795	431,299	15,456	50,220	22,567	227,543	32,176 0 0	1,953 8 0
	1910-1911.	165,109	435,298	70,716	393,949	16,128	71,424	11,367	179,255	33,655 0 0	2,339 15 0

P. PHILLIPOWSKY,
Assistant Commissioner of Salt,
Excise and Opium in Sind.

Karachi, 19*th July* 1912.

STATEMENT No. IV.

(*See* paragraph 14.)

Taulkawar statement showing the average selling price of salt which prevailed in the province of Sind during the year 1911-1912.

No.	Names of talukas.	Wholesale price per Indian maund.			Retail price per Indian maund.		
		Maurypur salt.	Panjab salt.	Deposit salt.	Maurypur salt.	Panjab salt.	Deposit salt.
	Karachi district.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
1	Karachi...	...	...	...	2 8 0	...	...
2	Mirpur Sakro	...	...	...	2 8 0	...	...
3	Ghorabari	...	...	...	2 0 0	...	...
4	Tatta	...	...	...	1 10 0	...	...
5	Sujawal	1 12 0	...	...	2 0 0	...	...
6	Mirpur Bathoro	1 15 0	...	...	2 8 0	...	...
7	Jati	1 14 0	...	...	2 0 0	...	...
8	Manjhand	11 0	...	...	1 14 0	...	...
9	Shahbandar	2 4 0	...	...	2 8 0	...	...
10	Kotri	1 12 0	...	...	1 10 8	...	...
11	Kohistan	...	...	...	2 4 8	...	...
	AVERAGE ...	1 14 0	...	...	2 2 5	...	...
	Hyderabad district.						
12	Hyderabad	1 12 0	...	...	2 0 0	...	...
13	Guni	1 14 2	...	...	1 14 8	...	...
14	Tando Bego	1 14 8	...	...	2 0 7	...	...
15	Badin	1 14 4	...	1 14 4	2 8 0	...	2 8 0
16	Dero Mohbat	1 12 0	...	...	2 0 0	...	...
17	Tando Alahyar	1 11 0	...	...	2 1 0	...	...
18	Hala	1 12 0	...	...	2 0 0	...	...
19	Shahdadpur	1 9 6	...	...	1 10 0	...	...
20	Sakrand...	1 12 0	...	...	2 0 0	...	...
21	Moro	1 15 0	...	...	2 0 0	...	...
22	Naushahro	2 1 0	...	...	2 8 0	...	...
23	Kandiaro	1 14 0	...	...	2 0 0	...	...
24	Nasrat	1 11 0	...	...	1 14 0	...	...
25	Digri	1 13 0	...	...	2 0 0	...	...
	AVERAGE ...	1 13 0	...	1 14 4	2 0 6	...	2 8 0
	Thar and Parkar district.						
26	Diplo	...	...	1 6 0	...	...	1 8 0
27	Mithi	...	...	1 8 0	...	...	1 10 8
28	Chachro...	...	...	2 0 0	...	...	2 4 0
29	Nagar Parkar	...	...	2 8 0	...	...	3 0 0
30	Sinjhoro	...	...	2 0 0	...	...	2 8 0
31	Pithoro	...	...	1 10 0	...	...	1 14 0
32	Umarkot	...	...	1 9 0	...	...	1 14 0
33	Khipro	...	...	1 6 6	...	...	1 9 6
34	Sanghar...	...	...	1 10 8	...	...	1 14 0
35	Mirpur Khas	...	...	1 10 0	...	...	1 12 0
36	Jamesabad	...	...	2 0 0	...	...	2 8 0
	AVERAGE ...	...	...	1 12 0	...	...	2 0 7
	Larkana district.						
37	Larkana...	1 12 0	...	...	2 0 0	...	...
38	Kambar...	2 0 0	...	...	2 4 0	...	...
39	Ratodero	1 13 0	...	...	1 14 0	...	...
40	Labdaria	1 13 0	...	...	2 0 0	...	...
41	Kakar	2 0 0	...	...	2 8 0	...	...
42	Mehar	1 14 0	...	...	2 0 0	...	...
43	Nasirabad	2 0 0	...	...	2 8 0	...	...
44	Dadu	1 12 0	...	...	2 8 0	...	...
45	Johi	2 0 0	...	...	2 8 0	...	...
46	Sehwan	1 12 0	...	...	2 8 0	...	...
47	Mero Khan	2 0 0	...	...	2 8 0	...	...
	AVERAGE ...	1 14 2	...	...	2 4 7	...	...
	Sukkur district.						
48	Sukkur	1 12 0	2 0 0	...	2 0 0	2 4 0	...
49	Shikarpur	1 12 0	...	...	2 0 0	2 0 0	...
50	Ghari Yasin	1 12 0	2 4 0	...	2 0 0	2 8 0	...
51	Mirpur Mathelo	2 0 0	2 4 0	...	2 4 0	2 8 0	...
52	Ubauro	2 0 0	2 4 0	...	2 4 0	2 8 0	...
53	Ghotki	1 14 0	2 4 0	...	2 0 0	2 8 0	...
54	Pano Akil	1 13 0	2 0 0	...	1 14 0	2 8 0	...
55	Rohri	1 13 0	2 0 0	...	1 14 0	2 4 0	...
	AVERAGE ...	1 13 6	2 2 3	...	2 0 6	2 6 0	...
	Upper Sind Frontier district.						
56	Jacobabad	2 2 0	...	...	2 8 0	...	...
57	Shahdadpur	2 0 0	...	...	2 4 0	...	...
58	Thul	2 4 0	...	...	2 8 0	...	...
59	Kashmor	2 0 0	...	...	2 8 0	...	...
60	Kandhkot	2 4 0	...	...	2 8 0	...	...
	AVERAGE ...	2 2 0	...	...	2 7 2	...	...
	AVERAGE of the PROVINCE ...	1 14 6	2 2 3	1 13 2	2 3 0	2 6 0	2 4 4

P. PHILLIPOWSKY,

Karachi, 19*th July* 1912. Assistant Commissioner of Salt, Excise and Opium in Sind.

STATEMENT No. V.-

(*See* paragraph 16.)

Showing details of cases of salt-smuggling dealt with by the Salt Department in Sind during the official year 1911-1912 contrasted with the year 1910-1911.

District.	Nature of offence.																How cases disposed of.										Total estimate value of confiscations.		Fines realised.	
	Illicit manufacture.				Smuggling from foreign territory.				Illicit removals from Deposits and Works.				Miscellaneous.				Total.				No. of persons arrested.		No. of persons convicted.		No. of persons acquitted.		Percentage of conviction on prosecution.		No. of cases revised on appeal or review.			
	1910-1911.		1911-1912.		1910-1911.		1911-1912.		1910-1911.		1911-1912.		1910-1911.		1911-1912.		1910-1911.		1911-1912.													
	No.	Quantity.	No.	Quantity.	No.	Quantity.	No.	Quantity.	No.	Quantity.	No.	Quantity.	No.	Quantity.	No.	Quantity.	No.	Quantity.	No.	Quantity.	1910-1911.	1911-1912.	1910-1911.	1911-1912.	1910-1911.	1911-1912.	1910-1911.	1911-1912.	1910-1911.	1911-1912.	1910-1911.	1911-1912.
		M. s. t.		M. s. t.		M. s. t.		M. s. t.		M. s. t.		M. s. t.		M. s. t.		M. s. t.		M. s. t.		M. s. t.							per cent.	per cent.			Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
Karachi ...	...	...	...	...	2	1 8 40	...	...	...	...	4	0 9 32	7	0 31 65	32	2 38 59	9	2 0 25	36	8 8 11	9	37	9	37	...	4	100	89	...	...	3 7 8	1 8 11	69 0 0	127 8 0
Hyderabad ...	...	...	...	...	...	...	...	...	...	...	1	0 1 20	...	...	...	...	...	...	1	0 1 20	...	1	...	1	...	...	100	100	...	...	...	...	...	3 0 0
Thar and Parkar...	...	...	6	0 4 37	...	...	...	...	...	...	...	...	3	0 7 49	...	...	3	0 7 49	6	0 4 37	3	6	3	6	...	...	100	100	...	...	0 2 3	0 3 3	11 0 0	9 0 0
Larkana ...	2	0 4 70	...	...	...	...	...	...	...	...	...	...	14	1 32 30½	10	5 20 66	16	1 37 20½	10	0 20 66	16	10	17	10	...	1	100	90	...	...	0 5 5	0 13 4	113 0 0	54 5 0
Sukkur ...	...	...	...	...	...	...	...	...	2	0 3 20	...	...	...	...	9	0 2 54½	...	...	11	0 5 74½	...	11	...	11	...	...	...	100	...	...	...	0 2 2	...	45 0 0
Upper Sind Frontier.	...	...	...	...	...	...	...	...	...	...	...	...	12	0 10 13	1	0 3 65	12	0 10 13	1	0 0 65	12	1	12	1	...	...	100	100	...	...	0 12 1	0 0 10	29 0 0	0 8 0
Total ...	2	0 4 70	...	...	2	1 8 40	...	...	...	...	7	0 13 72	36	3 1 77½	52	8 23 4½	40	4 15 27½	65	4 1 33½	41	66	41	66	...	5	100	...	...	...	4 11 4	3 12 6	221 0 0	239 5 0

STATEMENT No. VI.

(*See* paragraph 19.)

Showing the receipts from fresh-water fishery farms during the years 1907-1908 to 1911-1912.

Name of district.	1907-1908.	1908-1909.	1909-1910.	1910-1911.	1911-1912.
	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
Karachi	9,698 12 8	8,408 4 8	9,846 4 0	10,016 8 0	13,740 0 0
Hyderabad	35,471 12 0	46,535 5 4	49,910 5 0	45,791 7 0	47,915 6 0
Thar and Parkar	9,721 3 6	7,492 7 3	7,146 4 0	8,352 0 0	8,725 8 0
Larkana	35,777 11 0	39,820 13 4	33,997 3 2	34,169 1 4	30,033 14 0
Sukkur	19,198 6 8	28,303 6 0	25,915 2 0	31,789 2 0	28,386 10 0
Upper Sind Frontier	3,924 8 0	1,725 9 6	3,724 8 0	2,767 0 0	3,262 4 0
Total ...	1,13,792 5 10	1,32,285 14 1	1,30,039 10 2	1,33,585 2 4	1,32,063 10 0

Karachi, 19*th July* 1912.

P. PHILLIPOWSKY,
Assistant Commissioner of Salt,
Excise and Opium in Sind.

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REPORT

ON THE

ADMINISTRATION

OF THE

SALT DEPARTMENT OF THE BOMBAY PRESIDENCY

FOR THE

OFFICIAL YEAR 1912-1913,

WITH

APPENDICES.

18

BOMBAY
PRINTED AT THE GOVERNMENT CENTRAL PRESS
1913

No. C. R.—2571 of 1913.

From

W. C. SHEPHERD, Esquire, B. A., I. C. S.,
Collector of Salt Revenue,
Bombay;

To

H. O. QUIN, Esquire, I. C. S.,
Commissioner of Customs, Salt, Opium and Ábkári,
Bombay.

Poona, 19th July 1913.

Sir,

INTRODUCTORY.

I have the honour to submit the Annual Report on the Administration of the Salt Department for the financial year 1912-13.

Collector's office.

2. I was in charge of the Department throughout the year.

Supervising staff.

3. The supervising staff consisted throughout the year, as before, of one Collector, ten Assistant Collectors, and one Native Assistant.

Strength of the Department.

4. During the year under report the following changes were made in the subordinate establishment:—

(*a*) Under Commissioner's No. 1272, dated 24th February 1912, the pay of the Subhedár's post on the Northern Frontier Establishment was raised from Rs. 40 to Rs. 50, with effect from 1st March 1912.

(*b*) Under Government Resolution, Financial Department, No. 1126, dated 26th March 1912, two posts of twelve monthly peons on Rs. 9 each in the Rái Táluka were abolished in consequence of the creation of two lascars' posts on the Port Fund Establishment for guarding the new light at Utan.

(*c*) Under Commissioner's No. 2561, dated the 11th April 1912, the pay of the peon on Rs. 8 attached to the Khárághoda Dispensary was raised to Rs. 10 from 1st April 1912.

(*d*) Under Government Resolution, Revenue Department, No. 4273, dated the 3rd May 1912, the pay of the Head Clerk to the Collector of Salt Revenue was raised from Rs. 150 to Rs. 175, and a clerk's post on Rs. 30 in the Collector of Salt Revenue's office was abolished.

(*e*) Under Government Resolution, Revenue Department, No. 8411, dated the 7th September 1912, the two Customs Managers' posts in the Department were formally transferred from the Sarkárkuns' to the Inspectors' cadre.

(*f*) Under Government Resolution, Revenue Department, No. 10150, dated the 1st November 1912, the scale of pay of the menial establishment paid for by the proprietors of salt-works was made the same as that of the regular menial establishment.

(*g*) Under Government Resolution, Revenue Department, No. 11027, dated the 2nd December 1912, the pay of the Coast Guard Boat Establishment was revised and a time-scale of pay was introduced for the lascars.

(*h*) Under Government Resolution, Revenue Department, No. 7508, dated the 10th August 1912, the services of a clerk on Rs. 25 of the Ahmedabad Depôt were transferred to the newly opened Land Customs Náka at Salangpur on the Káthiáwár Frontier.

(*i*) Under Government Resolution, Revenue Department, No. 7526, dated the 12th August 1912, the telegraphic sanction of the 29th Sepetember 1911, to the revision of the Menial Establishment of the Department was confirmed and sanction was accorded to the supply of uniforms to the menials of the Department at Government expense without making any deductions from their pay on that account.

(*j*) Under Government Resolution, Revenue Department, No. 10504 of the 19th November 1912, deductions for pension contributions from the pay of the Menial Establishment employed on the Portuguese Frontier and in the Kárághoda Range were discontinued and the services of the Menial Establishment of the rest of the Presidency Division were treated as superior subject to such deductions.

(*k*) Under Government Resolution, Revenue Department, No. 368, dated the 14th January 1913, the Salt Depôt at Ahmedabad was permanently abolished.

Summary of constitution and operations of the Department.

5. A summary of the constitution and operations of the Department as a whole is subjoined, the corresponding figures for 1911-12 being given for the purpose of comparison :—

	1911-12.	1912-13.	Increase.	Decrease.
1. Number of supervising officers.	12	12	.....	.....
2. Number of subordinate establishment	5,892	5,890	.....	2
3. Number of tálukas ...	39	39	.....	.....
4. Number of salt-works ...	433	431	.....	2
5. Number of maunds of salt excised and imported by sea and land on payment of duty	1,21,63,018	1,16,54,551	.....	5,08,467
6. Number of maunds of salt delivered free at nominal rate of duty	8,46,753	9,33,744	86,991	.....
7. Total number of maunds of salt excised imported, delivered free, or at nominal duty	1,30,09,771	1,25,88,295	.....	4,21,476
8. Total Revenue ... Rs.	1,33,15,701	1,24,15,063	.....	9,00,638
9. Number of offences enquired into	105	159	54	.....

6. The financial results of the last year's administration, compared with those of the preceding four years, are exhibited below :—

Year.	Gross Receipts.	Expenditure.	Refunds.	Total of Expenditure and Refunds.	Net Receipts.	Percentage Charges on Gross Receipts.
	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
1908-09 ...	1,22,02,025 2 4	18,24,239 8 1	39,852 0 2	18,64,091 8 3	1,03,37,933 10 1	15 4 5
1909-10 ...	1,26,11,100 7 8	18,75,526 7 1	47,089 6 0	19,22,615 13 1	1,06,88,484 10 7	15 4 0
1910-11 ...	1,22,97,870 15 11	20,08,127 9 6	53,376 8 1	20,61,504 1 7	1,02,36,366 14 4	16 12 3
1911-12. ...	1,33,15,700 9 8	21,26,306 4 6	47,988 8 0	21,74,294 12 6	1,11,41,405 13 2	16 5 4
1912-13 ...	1,24,15,063 4 0	21,44,092 13 8	71,344 6 1	22,15,437 3 9	1,01,99,626 0 3	17 13 6

Mainly owing to a falling off in the receipts the percentage of charges increased by Rs. 1-8-0. The actual expenditure only increased very slightly. It must be remembered that last year the production and sale of salt were exceptionally large. The amount under refunds tends to increase steadily as more firms avail themselves of the concession given for salt used in factories.

SALT.

SALT.

General sources of supply.

7. The salt with which the Bombay Presidency Salt Department has to deal may conveniently be classified under three heads :—

(1) Baragra or Rann salt, made from brine wells on the edge of the Lesser Rann of Cutch in the two agars of Khárághoda and Udu, six miles apart, and jointly named the Pritchard Salt-Works. These are Government property and worked departmentally.

(2) Sea-salt made within the Presidency. Of this the one factory of Dhárásna on the South Gujarát Coast near Bulsár, is both Government property and worked departmentally. The rest, with three exceptions, are grouped within a radius of 30 miles of Bombay City, and the few of them which are Government property are leased to private individuals for working ; the majority are owned as well as worked privately.

(3) Imported salt, mostly from sea salt-works in Goa territory.

Appendix F indicates the relative importance of these three sources of supply to the Presidency.

Salt is issued at the nominal duty of a pice per maund (to cover cost of establishment only)to "Foreign Malabár", *i. e.*, to the States of Travancore and Cochin ; and free of all duty to the States of Janjira, Cambay and Rádhanpur and the Estates of Pátri and Jhinjuwáda on the Northern Frontier ; also occasionally in re-placement of duty-paid salt proved to have been lost at sea.

BARAGRA SALT.

BARAGRA SALT.

Produce and Sales.

8. The produce and sales of Baragra salt are given in Appendix A and the manner in which the issues were distributed during the year under report is shown in Appendix B.

The quantity of Baragra salt in stock at the beginning of the year was 20¼ lakhs of maunds against 21½ lakhs of maunds at the beginning of the previous year. The produce during the year 1911-12 was less than that of the previous year by about 1¼ lakhs of maunds owing to violent sand storms which were exceptionally prevalent during the manufacturing season of 1911-12. The decrease in removals of 1¼ lakhs of maunds is chiefly due to a falling off in the issues to the United Provinces and Central India owing to the removals last year being in excess of the demand.

Issues for local consumption.

9. There has been a falling off during the year under report in the removals to all the districts in Gujarát and the Gáekwár's territory owing partly to unusually large removals during 1911-12, and partly to the after effects of famine. The increase in removals to the Rewa Kántha Agency is attributed to the fact that heap salt which is harder than the stores salt having been removed to the agencies the merchants took advantage of the good quality offered for sale and removed salt in large quantities. The increase in the case of Pálanpur is due to the return of the people of the agency who had temporarily left the country on account of famine.

Through Booking System.

10. For payment of duty, salt traders beyond the Presidency availed themselves of 22 treasuries and one Railway Station against 21 treasuries and one Railway Statoin last year. The subjoined statement shows how the different systems of payment of duty on Baragra salt have worked during the year under report compared with the previous year :—

Names of places at which duty was collected.	1911-1912.	1912-1913.
	Maunds.	Maunds.
Head-quarters Office, Bombay, Main Stores, Khárághoda and Broach Customs House	9,69,190	7,51,807
At Treasuries beyond the Presidency	13,23,404	14,02,326
At Stations on the Indian Midland Railway	10,608	7,344
Total ...	23,03,202	21,61,477

Loss or Wastage.

11. The amount of salt written off as loss and wastage was 1 lakh of maunds against 2½ lakhs in the year 1911-12. The decrease is due partly to the wastage of about 69,000 maunds properly debitable against the stocks of 1910-11 having been shown in the accounts for 1911-12, and partly to the clearance of two heaps during 1911-12 as against only one heap in 1912-13. The loss observed in the closed and open stores was 52,780 maunds against 26,673 in the previous year owing to heavier rainfall in 1912-13 than in the previous year. The percentage of loss and wastage works out to 2.07 against 3·48 in the previous year.

Stock at the end of the year.

12. The quantity of Baragra salt in stock at the end of the financial year was 20⅔ of lakhs of maunds against 20¼ lakhs at the close of the previous year. If the 31 lakhs manufactured during the manufacturing season of 1912-13 but stored and brought to account after the close of the financial year, be added to the balance the total stock amounts to 51⅓ lakhs. In pursuance of the policy followed for some years past efforts were continued during the year under report to restore the two years' reserve required to be maintained at Khárághoda. Eleven additional pans—5 in the Khárághoda and 6 in the Udu agar—were opened. The stock is, however, still considerably below the average annual demand plus two years' reserve. Government have already sanctioned the opening of a new salt-work capable of producing about 8 lakhs of maunds between Khárághoda and Udu. If an adequate supply of drinking water is provided for in the new salt-work before October next by the Public Works Department who are making boring experiments near the site selected for the salt-work as many pans as can be opened will be worked during the next manufacturing season.

The manufacturing season.

13. The following table gives details of the manufacture of salt at the Pritchard Salt Works during the last two seasons:—

Salt Works.	Season.	Number of pans worked.	Total crop.	Average yield per pan.	Maximum yield per pan.
			Maunds.	Maunds.	Maunds.
Khárághoda	1911-12	255	13,29,790	5,215	10,637
	1912-13	260	14,42,856	5,549	10,823
Udu	1911-12	285	15,57,930	5,466	11,385
	1912-13	291	16,63,536	5,717	11,424
Total ...	1911-12	540	28,87,720	5,341	11,385
	~~1913-13~~ 1912-13	551	31,06,392	5,633	~~10,823~~ 11,424

It is very satisfactory to note that the average yield per pan shows a substantial increase in both the agars. It is also reported that in the estimation of those competent to express an opinion the quality of salt was better than that of any produced during the last nine years. These results, especially at a time when a large number of agrias were unable to work for days together during the prevalence of a serious epidemic of malaria lasting up to December 1912, are extremely creditable to the Assistant Collector, Mr. Steele, who was most ably assisted by Khán Sáheb Ghulam Yassein, Inspector, Pritchard Salt Works, an officer whose value to the Department it would be difficult to overestimate.

Brine was let into the first pan at Khárághoda on the 28th October 1912 and into the last pan on the 19th December 1912. The first pan was cleared on the 21st March 1913, and the last pan on 30th April 1913. At Udu brine was let into the first pan on the 28th October 1912, and into the last pan on 16th December 1912. The first pan was cleared on 31st March 1913, and the last on the 27th May 1913.

Storage.

14. The storage operations began on 17th April 1913, and ended on the 29th May 1913. The daily average of the storage was 72,242 maunds against 68,755 in the previous year. Owing to the strengthening of the main line and sidings in the Udu agar it was found possible to use heavier engines for the removal of salt from the agars to the stores and the storage operations were thus completed in a less time than would otherwise have been required. No appreciable difficulty was experienced in obtaining the required number of labourers.

15. The quantity of salt on which cost price at 1 anna 6 pies per Indian maund was paid to the Agrias during the manufacturing season of 1912-13 was 29½ lakhs of maunds and the amount paid for it was Rs. 2,76,663. This divided amongst 1,653 Agrias gives Rs. 167 per head for a working season. The total amount advanced to Agrias as takávi during the year was Rs. 4,466 against Rs. 2,744 last year. The increase is due to the fact that a number of new men had to be engaged in place of old Agrias who deserted and also to work the additional pans. Cost price paid and advances made to Agrias.

16. The rainfall at Khárághoda during the year under report was 23.90 inches against 4.44 inches during the previous year. There was a good supply of water throughout the year. The boring experiments in the Khárághoda village sanctioned in Government Resolution, Public Works Department, No. C.W.—2237 of 15th November 1911, were continued during the year under report. Water was struck at 248 feet below ground level on 8th May 1912, and the discharge gradually rose to 500 gallons per minute. The quality of the water was good and we hoped that the difficult problem of the Khárághoda water-supply had at last been solved. But unfortunately seven days after artesian conditions were fully established the pipe gradually began to get choked up and finally the inner pipe was completely plugged up by a mixture of clay and sand. Attempts were made to remove this clay and sand but without success. In October 1912, the experiments were continued on the same site with perforated pipes and artesian conditions were re-established at a depth of 258 feet but the trouble from sand and clay could not be got over. The inner drive pipe again got choked up and the boring experiments on the site in question had to be abandoned. It is, however, proposed by the Sanitary Engineer to make further experiments on a new site in the vicinity as there are grounds to believe that there is a good underground supply of water in the locality. Khárághoda village.

Another boring experiment is being made in the Rann between Khárághoda and Udu near the site selected for the New agar in order to supply drinking water to the men working in the new agar. Boring operations were commenced on 9th April 1913, and artesian conditions were established on 23rd May at the depth of 210 feet. The flow is estimated at 300 gallons per minute but the water is too saline for drinking purposes at present. It is, however, hoped that it will improve in time.

The vital statistics of the new Government village at Khárághoda during the year under report read as follows :—

There were 92 births or 38.6 per mille against 113 or 42.4 per mille in 1911-12. The number of deaths was 126 or 52.9 per mille against 73 or 27.4 per mille in the previous year. This heavy mortality was mainly due to malarial fever. The population of the village was 2,380 as compared with 2,662 last year. The total number of patients treated at the dispensary was 6,091 against 4,106 last year. The most common diseases were as usual malarial fever conjunctivitis, diseases of the digestive system and of the skin.

SEA SALT.

17. There was a small decrease of about 17,000 maunds in the produce of the Dhárásna salt-work owing to a heavy and unusual rainfall in November 1912, which retarded manufacturing operations nearly a month. *PRODUCE.* Dhárásna.

The Konkan salt-works, including the Shiroda and Sánikatta works, show an increase of over 6 lakhs of maunds. The increase really belongs to the manufacturing season of 1911-12 when the salt-works were worked to their utmost capacity for reasons given in paragraph 25 of the last year's Administration Report. The quantity of salt brought to account in April, May and June 1912 having been included in the figures for 1912-13 they show an increase over the figures for 1911-12. There was a large increase in the produce of the Sánikatta works owing to the fact that 124 agars were worked during the year under report against 35 in the previous year, in order to make up the stocks of salt. Konkan.

Sales.

18. As was anticipated the sales have fallen off by about 3 lakhs of maunds owing to the fact that in 1911-12 the Shilotries had to remove as much salt as possible, in order to make room on the storage platforms for the large quantities produced by them in that year. The sales were, however, higher than in any of the years previous to 1911-12. The decrease in removals from Dhárásna which amounts to about half a lakh was entirely due to trade fluctuations.

The quantities of sea-salt removed to the various Provinces during the year under report are compared with those of the previous year in Appendix C. The decreases of 131,888 and 5,814 maunds in removals to the Central Provinces and Central India, respectively, are the natural consequences of the unusually large removals in 1911-12. Looking to the large quantity of salt exported to the Nizám's territory every year the decrease of 38,000 maunds is insignificant and may be attributed to ordinary trade fluctuations. The increase of 1½ lakhs of maunds in removals to Calcutta is due to a large quantity of refuse salt which is usually destroyed before it is stored and brought to account having been stored on the platforms, in order to swell the produce and subsequently sold to merchants in Bengal at a nominal price. The falling off in the removals to the Madras Presidency amounting to about 2½ lakhs of maunds is counterbalanced by an increase of nearly 3 lakhs in the sales of salt manufactured locally in the Madras Presidency. Owing to an increased production in that Presidency the market prices of locally manufactured salt went down and it was not therefore possible for the Bombay merchants to compete successfully with the Madras merchants. The increase in exports to Foreign Malabár is believed to be due to a greater demand for salt for industrial and agricultural purposes.

Loss and wastage.

19. The loss and wastage returned at Dhárásna was 23,005 maunds against 24,218 maunds in the previous year, out of which 22,691 is reported to be due to over-estimation.

At the other sea salt-works the loss and wastage amounted to 7¾ lakhs of maunds against 5½ lakhs in the previous year as shown below :—

	Maunds.
Wastage from moisture	1,14,644
Loss by over-estimation	5,76,248
„ „ theft	11
„ „ floods	78
„ „ destruction of unsaleable refuse salt	70,208
	7,61,189

The percentage of loss and wastage is 6·9 against 5·03 in the previous year. The increase is due partly to the loss caused by the untimely rainfall in November 1912, soon after the heaps had been opened after the monsoon, and partly to the destruction of a larger quantity of refuse salt which had been stored and brought to account in 1911-12, in order to swell the figure of produce. There is an increase of nearly 1½ lakhs of maunds in loss by over-estimation. Our present practice of estimating the contents of heaps is defective. An eye-estimation can never be accurate and the rules therefore allow a margin of 25 per cent. The present method of estimation causes, in my opinion, unnecessary waste of time and labour with no adequate advantage in return. I am considering the possibility of revising the whole system, and shall probably be able to introduce new rules next working season, which will greatly reduce the work of estimating and recording stocks of salt.

Stock at the close of the season.

20. The balance of salt in the sea salt-works including Dhárásna on the 30th June this year was 54½ lakhs of maunds against 62 lakhs on the same date last year. The balance includes the produce of the whole season, less sales upto 30th June, whereas that shown in the Appendix A represents the balance at the end of the financial year, *i. e.*, in the middle of the manufacturing season, and is consequently of no use for the purpose of showing the sufficiency or otherwise of stocks. As reported in the last year's report the salt-works were worked to their utmost capacity in 1911-12, in order to prove that the existing works were capable of meeting the present demand for salt, and

consequently there was an unusually large balance at the end of June 1912. The efforts to maintain large stocks of salt on hand were continued during the year under report, but owing to the untimely rains in November last and an early break of the monsoon the manufacturing season was curtailed and the stocks on hand decreased by about 7½ lákhs. They are still more than in any of the previous five years and are quite sufficient to meet requirements till new salt is in the market next season. The average annual sales during the last few years have been about 92 lakhs of maunds, representing an average sale of over 7½ lakhs of maunds a month. During July, August and September, however, business is practically at a standstill and in October and November removals are not brisk. Government have already decided that the construction of the Bhándup works should be postponed *sine die*. The possession of the land acquired for the purpose has, however, been retained.

Prices of salt at the salt-works.

21. The following table shows the maximum, the minimum and the average prices of salt in the Northern and Middle Konkan, Shiroda and Sánikatta Salt-works :—

	Northern and Middle Konkan.				Shiroda.				Sánikatta.			
	1911-12.		1912-13.		1911-12.		1912-13.		1911-12.		1912-13.	
	Rs. a. p.		Rs. a. p.		Rs. a. p.		Rs. a. p.		Rs. a. p.		Rs. a. p.	
Maximum per maund ...	0	8 0	0	9 0	0	6 0	0	5 0	0	6 0	0	4 0
Minimum per maund ...	0	0 3	0	0 3	0	1 0	0	2 0	0	2 6	0	1 6
Average per maund ...	0	2 0	0	1 11	0	3 10	0	3 11	0	3 6	0	2 2

Very few transactions took place at the highest and the lowest prices. The rates generally prevailing were 4, 3, 2 and 1 anna and three pies per maund in the Northern and Middle Konkan and 5, 4, 3 and 2 annas in Shiroda and 4, 3½, 3¼, 3, 2¼, 2 and 1½ annas in Sánikatta. The variations in the average rates are trifling as compared with the rate for the last year.

Imported Salt.

Quantity and distribution of imported salt.

22. The quantity and distribution of salt imported into the Bombay Presidency are given in Appendix D.

The quantity of Goa salt imported during the year was almost the same as in the previous year, *viz.*, 3½ lakhs of maunds. The greater part was as usual imported by rail for Belgaum, Dhárwár, Bijápur, Madras and Mysore. The imports for the Madras Presidency show a slight decrease; but the exports to Mysore which were going down since 1909-10 have again risen to the normal figure of 85,000 maunds.

Consumption.

Consumption of salt in the Presidency proper.

23. The total quantity of salt issued and imported for consumption in the Bombay Presidency is shown in the subjoined table.

As the amount of salt required by an adult for his own consumption during a year is about 12 lbs., it is evident that the consumption of licit salt is greater than that required for human consumption. This may be taken as evidence that smuggling of salt does not go on to any appreciable extent.

Name of Province.	Year.	Quantity.	Population.	Average per head.
		Maunds.		Lbs.
Gujarát	1911-12	9,80,525	65,30,918	12·4
	1912-13	9,42,692		11·9
Konkan, Deccan and Southern Marátha Country.	1911-12	25,64,919	1,56,15,054	13·5
	1912-13	24,85,525		13·1
Total ...	1911-12	35,45,444	2,21,45,972	13·2
	1912-13	34,28,217		12·7

Market prices.

24. The average market prices of salt in each district of the Presidency during the last four years will be found in Appendix G. As desired by you the figures have been arrived at by the same process of calculation in each district. On comparison of the prices for the year 1912-13 with those for the previous year, it will be seen that the prices in the Ahmedabad, Kaira, Panch Maháls and Broach Districts, where Baragra salt is supplied mainly through the agencies at a fixed price remained stationary. The difference in the price in all the other districts, except Ratnágiri, Násik, West and East Khándesh and Dhárwár, is insignificant and is due to trade fluctuations. The increase in the Ratnágiri District is attributed to the high range of prices during the last monsoon owing to insufficient stocks in the market. In the Násik and Dhárwár Districts the rise is due to combination among the retail vendors to maintain the price at a high level. The prices in the East and West Khándesh show a slight improvement.

As desired by Government an attempt was made to secure an accurate record of prices at which salt is sold in the City of Bombay. On careful enquiries made by the Sarkárkún of Mátunga every month from September 1912 to May 1913, it appears that it is practically impossible to keep an accurate record since the price in two shops in the same locality often varies. It depends on various causes but it does not in the least affect the consumers as they buy in local seers for want of accommodation to store large quantities in their houses. No departmental action can possibly be taken to keep down the prices and further enquiries into the matter have therefore been stopped under your orders.

Revenue and Expenditure.

SALT REVENUE. Revenue and Expenditure.

25. The receipts and expenditure on account of Salt Revenue for the year under report are shown in Appendix H. An explanation of some of the chief items on both sides of the accounts is given below.

Items of variations in Revenue.

26. The decrease of over Rs. 8¼ lakhs under "Excise duty" on salt issued from the salt-works is entirely due to the payment of duty in the previous year on a large quantity of salt removed during 1912-13. Appendix I shows what the transactions—credit and cash—have been during the past three years.

Items of increase in Expenditure.

27. The increase of Rs. 1,356 under "House-rent allowance" is due to the payment of arrears to the lascars and also to the increase from 10 to 20 per cent. in the house-rent allowance given to Coast Guard Inspectors during their stay in Bombay. Owing to the grant of double horse allowance to the Inspectors on the Northern Frontier during the last famine there was an increase of Rs. 4,903 under the head "Horse Allowance." Famine conditions continued till the end of November last and consequently there was an increase of Rs. 42,986 under "Grain Compensation Allowance." The increase of Rs. 550 under "Clothing to lascars" is due to the supply of woollen clothing during the year under report. There was an increase of Rs. 30,231 under "Petty Construction" owing to the purchase of the distillery peons' lines at Uran for the use of the clerical establishment of the Sarkárkún of Uran and to the reconstruction of the Sowárs' lines at Khárághoda for which special grants were allotted by Government. The increase of Rs. 6,797 under "Arms and Accoutrements" is due to the septennial supply of leather accoutrements to the Northern Frontier force being made during the year, and of Rs. 560 under "Khárághoda dispensary charges" to the supply of certain books and medicines in addition to the usual supply. There was an increase of Rs. 49,859 under "Salt Agents' Bagging and Sewing charges" owing to a number of bills for the previous year having been paid during 1912-13. The expenditure under this head, however, does not imply a real charge to the State as it is eventually recovered from Salt merchants. An expense of Rs. 500 was incurred in 1912-13 in sending some of the Sowárs' horses to Godhra on account of scarcity of water and fodder at Khárághoda. Owing to the removal of the office of the Assistant Collector of Salt Revenue, Coast Guard Service, to the Sewree Dockyard, a telephone connection had to be provided for in his office to enable him to ascertain prices of stores, etc., from firms in the Fort.

28. The decrease of Rs. 34,584 under "bonus allowance" requires no explanation. The decreases of Rs. 850 and 139 under "plague allowance" and "epidemic charges" respectively are due of course to there being less plague during the year. No jolly boats having been renewed during the year under report there was a decrease of Rs. 1,530 under "purchase of boats". There was also a decrease of Rs. 34,103 under "peons' clothing" as the men on the Northern Frontier and in the Presidency division were supplied with cotton clothing only. The work of laying down heavy rails in the Udu salt-works was completed in April 1912 and the balance due to the Railway Company was paid by adjustment. There was thus a decrease of Rs. 40,927 in expenditure on this account. Items of decrease in Expenditure.

MISCELLANEOUS.

29. The number of fish-curing yards open for business was the same as in the previous year, *viz.*, 31. Appendix J shows in detail the transactions at all the yards during the year under report. The total quantity of fish brought to be cured fell from 2,48,332 to 2,17,668 maunds owing to an unfavourable fishing season. The proportion of weight of fresh fish to each maund of salt at the various yards does not show such appreciable variation as to require any explanation. Fish-curing Yards.

30. The financial results of the working of the yards during the year under report show a loss of Rs. 957. The loss last year was Rs. 795. If the unsatisfactory results continue during the current year it will have to be considered whether the cost price of salt should again be raised to 8 annas a maund.

31. In the Ratnágiri Táluka only did the fishermen avail themselves of the concession of taking salt from the yards for curing fish at sea. The fishermen in the other tálukas did not take advantage of the concession as they do not remain out at sea for more than 24 hours.

32. The details of offences against the Salt Law during the year under report are given in Appendix K. The number of cases in the Northern Division fell from 7 to 2 and on the Goa Frontier from 23 to 17 owing probably to the fact that smuggling of salt is now less profitable than it used to be. The number of cases on the Daman Frontier increased from 3 to 6 but they were all petty cases of illicit possession of small quantities of Daman Salt. There has been a large increase in the number of cases detected in the Southern Division. Most of them, however, were on account of illicit possession and removal of salt-earth and were detected in the Ratnágiri and Kánara Districts. The illicit removal of salt-earth does not, however, affect the Revenue to an appreciable extent, since very few people now resort to illicit manufacture of salt from salt-earth on account of the low rate of duty. The salt-earth removed illicitly is generally used for preserving fish. Offences.

The sentences passed by the Magistrates were on the whole satisfactory.

In the Uran Range the Kátkaris not infrequently raid the salt-works and I have addressed the Collectors of Thána and Kolába on the question of the advisability of bringing the Kátkaris under the Criminal Tribes Act.

33. The nine Government salt-works in the Shiroda Táluka were leased separately during the year under report for a period of one year only for Rs. 2,235 as no better offers could be received for a longer period owing partly to a decrease in the demand for Shiroda salt in British Malabár and partly to a fall in the selling price of Sánikatta salt. The former lease was for Rs. 2,501. Farms of Government Salt-works.

34. During the year under report a separate Assistant Collector of Excise having been appointed for Southern Gujarát, the Assistant Collector of Salt Revenue, Surat Range, was relieved of excise work and was thus able to pay closer attention than before to Salt and Customs matters. Concluding Remarks.

From 1st May last, the Uran Distilleries which were controlled by the Collector of Salt Revenue were transferred to the Assistant Commissioner of Excise. The Assistant Collector of Salt Revenue, Uran Range, was thus relieved of the excise work performed by him.

35. In pursuance of suggestions made by you a malarial survey has been undertaken in Khárághoda and experiments will shortly be made in the direction of rendering Inspectors' bungalows mosquito proof. Judging from the success that has attended operations against the malarial mosquito elsewhere, there seems no reason, provided we can obtain adequate expert assistance, why Khárághoda should not become as free from malaria as, for example, Ismailia.

36. The water-supply in most of the salt tálukas continued unsatisfactory in spite of sufficient and timely rainfall. The well at Dhárávi which supplies the establishment at Rái has been improved at a cost of Rs. 1,625 and four other springs in the vicinity of the well have been diverted to the existing gallery. It is assumed by the Public Works Department that the supply will not fall short of 2,000 gallons per day. This quantity is, however, insufficient for our requirements but no better arrangement can be made until the Sálsette development scheme has been completed. The improvement of the Shahapada water-works which supply water to the Pen Táluka is receiving the attention of the Public Works Department.

37. During the year under report our whole system of accounts was carefully overhauled by Mr. Sandford, Auditor of Custom House Accounts. He has suggested some great improvements which are now being carried into effect. The new forms proposed by him have been introduced from 1st April 1913 and are reported to be working well. Mr. Sandford is at present engaged in revising the Saza account forms and the forms in use at Khárághoda.

38. During the year I have carefully examined the existing forms and returns in use in the Department and have been able to dispense with a considerable number altogether and simplify several others. I have also introduced an improved method of dealing with correspondences and am now revising the A and B lists. I am confident that already the clerical work has been considerably reduced and that it will be reduced still further. I hope also before long to put before you a scheme for a complete re-organization of the Coast Guard Service, which is urgently in need of a thorough reform.

I have attempted to impress upon my Assistant Collectors the importance of discipline and smartness in the very large menial establishment of the department and the increased attention to drill and provision of a more workmanlike uniform have already begun to produce satisfactory results.

39. The form of the present report has been modified and most of the information which is given in the appendices has been eliminated from the body of the report, in accordance with the proposals sanctioned by you.

I have the honour to be,

Sir,

Your most obedient servant,

W. C. SHEPHERD,

Collector of Salt Revenue.

APPENDICES

APPENDIX

Statement showing the Produce and Sales of Salt manufactured

Tálukas.		Number of Sazas.	Number of Salt Works.	Balance at the commencement of the year.	Produce.	Total of Balance and Produce.
Baragra Salt.				Mds. s. t.	Mds. s. t.	Mds. s. t.
Khárághoda ...	1911-12 ...	2	2	21,37,424 14 0	30,18,307 17 0	51,55,731 31 0
	1912-13 ...	2	2	20,20,709 0 0	28,87,726 21 0	49,08,435 21 0
Sea Salt.						
Dhárasna ...	1911-12 ...	1	1	11,968 0 0	4,32,622 0 0	4,44,590 0 0
	1912-13 ...	1	1	25,045 0 0	4,15,290 0 0	4,40,335 0 0
Maroli ...	1911-12 ...	1	1	758 0 0	16,602 0 0	17,360 0 0
	1912-13 ...	1	1	1,630 0 0	21,820 0 0	23,450 0 0
Bassein ...	1911-12 ...	7	29	1,06,351 0 0	15,87,104 17 0	16,93,455 17 0
	1912-13 ...	7	29	1,08,783 30 0	16,58,825 10 0	17,67,609 0 0
Rái ...	1911-12 ...	9	46	1,02,661 20 0	13,01,034 5 0	14,03,695 25 0
	1912-13 ...	9	46	1,00,904 20 0	13,10,342 20 0	14,11,247 0 0
Trombay ...	1911-12 ...	4	24	44,239 30 0	9,92,087 10 0	10,36,327 0 0
	1912-13 ...	4	24	46,108 10 0	10,20,274 0 0	10,66,382 10 0
Mátunga ...	1911-12 ...	6	28	44,830 0 0	10,26,386 0 0	10,71,216 0 0
	1912-13 ...	5	22	42,704 30 0	9,84,650 25 0	10,27,355 15 0
Belápur ...	1911-12 ...	6	19	49,763 34 40	7,77,713 15 40	8,27,477 10 0
	1912-13 ...	6	19	32,747 30 0	7,78,747 0 0	8,11,494 30 0
Uran ...	1911-12 ...	5	40	21,017 20 0	10,74,566 0 0	10,95,583 20 0
	1912-13 ...	5	40	30,976 10 0	11,87,840 20 0	12,18,816 30 0
Pen ...	1911-12 ...	5	28	57,139 2 40	3,45,606 19 0	4,02,745 21 40
	1912-13 ...	5	28	47,586 20 0	3,63,256 10 0	4,10,842 30 0
Karanja ...	1911-12 ...	4	24	19,204 20 0	7,83,894 10 0	8,03,098 30 0
	1912-13 ...	4	24	1,13,539 20 0	8,91,918 0 0	10,05,457 20 0
Shewa ...	1911-12 ...	6	41	67,178 10 0	18,20,042 0 0	18,87,220 10 0
	1912-13 ...	6	40	44,611 20 0	18,66,675 0 0	19,11,286 20 0
Shiroda ...	1911-12 ...	1	27	47,097 20 0	85,577 20 0	1,32,675 0 0
	1912-13 ...	1	27	37,598 0 0	96,377 20 0	1,33,975 20 0
Sanikatta ...	1911-12 ...	1	128	1,27,316 0 0	32,600 0 0	1,59,916 0 0
	1912-13 ...	1	128*	28,507 0 0	2,60,182 0 0	2,88,689 0 0
Total of Sea Salt ...	1911-12 ...	56	431	6,99,524 37 0	1,02,75,835 16 40	1,09,75,360 13 40
	1912-13 ...	55	429	6,60,742 30 0	1,08,56,198 25 0	1,15,16,941 15 0
Grand Total ...	1911-12 ...	58	433	28,36,949 11 0	1,32,94,142 33 40	1,61,31,092 4 40
	1912-13 ...	57	431	26,81,451 30 0	1,37,43,925 6 0	1,64,25,376 36 0

* 124 Salt-works were worked against 35 in the previous year.

A.

in the Bombay Presidency for the years 1911-12 and 1912-13.

Sales.				Loss and Wastage.	* Total of Sales and Loss and Wastage.	Balance in hand at the close of the year.
On payment of Full Duty.	On payment of Nominal Duty.	Free of Duty.	Total.			
Mds. s. t.	Mds. s. t.	Mds. s. t.	Mds. s. t.	Mds. s. t.	Mds. s. t.	Mds. s. t.
28,85,400 0 0	.....	1,531 20 0	28,86,931 20 0	2,48,091 11 0	31,35,022 31 0	20,20,709 0 0
27,54,367 0 0	.....	1,531 20 0	27,55,898 20 0	1,01,838 1 0	28,57,736 21 0	20,50,699 0 0
3,95,327 0 0	.....	.....	3,95,327 0 0	24,218 0 0	4,19,545 0 0	25,045 0 0
3,48,574 0 0	.....	.....	3,48,574 0 0	23,005 0 0	3,71,579 0 0	68,756 0 0
15,309 0 0	.....	.....	15,309 0 0	421 0 0	15,730 0 0	1,630 0 0
19,595 0 0	.....	.....	19,595 0 0	2,249 0 0	21,844 0 0	1,606 0 0
15,28,762 10 0	.....	.....	15,28,762 10 0	55,909 17 0	15,84,671 27 0	1,08,783 30 0
14,52,132 0 0	.....	.....	14,52,132 0 0	1,07,276 20 0	15,59,408 20 0	2,08,200 20 0
12,01,321 10 0	.....	.....	12,01,321 10 0	1,01,469 35 0	13,02,791 5 0	1,00,904 20 0
10,92,866 0 0	.....	.....	10,92,866 0 0	1,10,467 20 0	12,03,333 20 0	2,07,918 20 0
9,33,714 20 0	.....	.....	9,33,714 20 0	56,504 10 0	9,90,218 30 0	46,108 10 0
9,35,604 20 0	.....	320 0 0	9,35,924 20 0	75,701 10 0	10,11,625 30 0	54,756 20 0
9,86,022 30 0	.....	20 20 0	9,86,043 10 0	42,468 0 0	10,28,511 10 0	42,704 30 0
9,41,058 20 0	.....	100 5 0	9,41,158 25 0	65,195 30 0	10,06,354 15 0	21,001 0 0
7,60,750 0 0	.....	287 0 0	7,61,037 0 0	33,692 20 0	7,94,729 20 0	32,747 30 0
6,77,534 0 0	.....	.....	6,77,534 0 0	64,161 10 0	7,41,695 10 0	69,799 20 0
6,11,883 30 0	3,37,314 0 0	62,216 10 0	10,11,414 0 0	53,193 10 0	10,64,607 10 0	30,976 10 0
6,18,171 20 0	3,81,594 0 0	54,190 0 0	10,53,955 20 0	62,693 30 0	11,16,649 10 0	1,02,167 20 0
3,19,817 20 0	.....	.....	3,19,817 20 0	35,341 21 40	3,55,159 1 40	47,586 20 0
2,92,778 30 0	.....	.....	2,92,778 30 0	39,250 34 40	3,32,029 24 40	78,813 5 40
3,03,751 0 0	3,38,754 0 0	.....	6,42,505 0 0	47,054 10 0	6,89,559 10 0	1,13,539 20 0
4,02,935 0 0	4,02,456 0 0	267 20 0	8,05,658 20 0	74,964 20 0	8,80,623 0 0	1,24,834 20 0
16,70,902 10 0	83,242 0 0	2,880 0 0	17,57,024 10 0	85,584 20 0	18,42,608 30 0	44,611 20 0
15,52,118 20 0	70,802 0 0	5,325 0 0	16,28,245 20 0	1,32,623 20 0	17,60,869 0 0	1,50,417 20 0
85,478 0 0	.....	500 0 0	85,978 0 0	9,099 0 0	95,077 0 0	37,598 0 0
79,947 20 0	.....	.....	79,947 20 0	8,124 0 0	88,071 20 0	45,904 0 0
1,02,535 0 0	.....	20,008 0 0	1,22,543 0 0	8,866 0 0	1,31,409 0 0	28,507 0 0
1,33,806 0 0	.....	17,158 0 0	1,50,964 0 0	18,481 20 0	1,69,445 20 0	1,19,243 20 0
89,15,574 10 0	7,59,310 0 0	85,911 30 0	97,60,796 0 0	5,53,821 28 40	1,03,14,617 28 40	6,60,742 30 0
85,47,121 10 0	8,54,852 0 0	77,360 25 0	94,79,333 35 0	7,84,194 14 40	1,02,63,528 9 40	12,53,413 5 40
1,18,00,974 10 0	7,59,310 0 0	87,443 10 0	1,26,47,727 20 0	8,01,912 34 40	1,34,49,640 14 40	26,81,451 30 0
1,13,01,488 10 0	8,54,852 0 0	78,892 5 0	1,22,35,232 15 0	8,86,032 15 40	1,31,21,264 30 40	33,04,112 5 40

W. C. SHEPHERD,
Collector of Salt Revenue.

APPENDIX B.

Statement showing the Distribution of Baragra salt during the years 1911-12 and 1912-13.

Name of Province or District.	1911-12.	1912-13.	Increase or Decrease.
	Mds.	Mds.	Mds.
Central Provinces	6,49,128	6,31,176	– 17,952
United Provinces	10,70,172	10,00,431	– 69,741
Central India Malva and Rájputána ...	5,83,902	5,29,870	– 54,032
Total ...	23,03,202	21,61,477	– 1,41,725
Local consumption.			
Ahmedabad	1,36,208	1,32,906	– 3,302
Kaira	1,07,394	1,00,036	– 7,358
Panch Mahálś	67,653	62,040	– 5,613
Broach	4,488	3,672	– 816
Surat	1	1	.....
Gáikwár's Territory	1,38,579	1,35,511	– 3,068
Mahi Kántha Agency	50,419	53,094	+ 2,675
Rewa Kántha Agency	24,903	42,666	+ 17,763
Pálanpur Agency	34,150	45,433	+ 11,283
Káthiáwár Agency	2,120	2,079	– 41
Cambay	10,464	9,630	– 834
Bombay	4,494	4,083	– 411
Poona	.....	6	+ 6
East Khándesh	2,856	3,264	+ 408
Total ...	5,83,729	5,94,421	+ 10,692
Grand Total ...	28,86,931	27,55,898	– 1,31,033

W. C. SHEPHERD,
Collector of Salt Revenue.

APPENDIX C.

Comparative Statement showing the Quantities of Salt removed for consumption within and without the Presidency from the Sea Salt Works in British Territory, together with the distribution of Issues.

	Central Provinces.		Central India.		Nizám's Territory.		Calcutta.		Madras Presidency.	
									British Malabár.	
	1911-1912.	1912-1913.	1911-1912.	1912-1913.	1911-1912.	1912-1913.	1911-1912.	1912-1913.	1911-1912.	1912-1913.
	Mds.	Mds.	Mds.	Mds.	Mds.	Mds.	Mds.	Mds.	Mds.	Mds.
Dhárasna	...	816	...	...	...	...	...	...	.....	...
Maroli	...	...	...	...	...	...	...	...	.....	...
Bassein, Rai, Trombay, Mátunga, Uran, Shewa, Belápur, Karanja and Pen.	16,28,485	14,95,781	27,564	21,750	14,17,531	13,79,531	8,33,907	9,91,513	14,54,947	13,24,869
Shiroda	...	...	...	...	...	...	...	...	16,184	4,141
Sánikatta	...	...	...	...	...	...	...	...	.....	990
Total ...	16,28,485	14,96,597	27,564	21,750	14,17,531	13,79,531	8,33,907	9,91,513	14,71,131	13,30,000

	Madras Presidency—*continued.*				Foreign Malabár.		Mysore.		Within the Presidency.		Total.	
	Rest of the Presidency.		Total.									
	1911-1912.	1912-1913.	1911-1912.	1912-1913.	1911-1912.	1912-1913.	1911-1912.	1912-1913.	1911-1912.	1912-1913.	1911-1912.	1912-1913.
	Mds.	Mds.	Mds.	Mds.	Mds.	Mds.	Mds.	Mds.	Mds.	Mds.	Mds.	Mds.
Dhárasna ...	...	...	...	...	...	...	...	...	3,95,327	3,47,758	3,95,327	3,48,574
Maroli ...	...	...	...	...	...	...	...	...	15,309	19,595	15,309	19,595
Bassein, Rai, Trombay, Mátunga, Uran, Shewa, Belápur, Karanja and Pen.	3,81,757	2,69,841	18,36,704	16,94,710	7,59,370	8,54,852	5,48,820	5,36,964	20,89,318	20,05,153	91,41,639	88,80,254
Shiroda ...	...	11,440	16,184	15,581	...	...	...	...	69,794	64,366	85,978	79,947
Sánikatta ...	501	6,289	501	7,279	...	...	...	152	1,22,042	1,43,533	1,22,543	1,50,964
Total ...	3,82,258	2,87,570	18,53,389	16,17,570	7,59,370	8,54,852	5,48,820	5,37,116	26,91,790	25,80,405	97,60,796	94,79,334

W. C. SHEPHERD,
Collector of Salt Revenue.

APPENDIX

Statement showing Quantities of Foreign Salt imported by Sea

Description of Salt.	Importations by Sea.					Place of Export.
	Place of Export.	Place of Import.	Mode of Conveyance.	Quantity imported.	Amount of Import Duty levied.	
				Mds. s. t.	Rs. a. p.	
Table and Packing Salt.	United Kingdom.	Bombay ...	Steamer ...	14,952 1 60	14,955 7 9	
Do. ...	Holland ...	Do. ...	Do. ...	92 13 0	92 5 6	
Do. ...	United States of America.	Do. ...	Do. ...	10 12 0	10 4 5	
Do. ...	Natal ...	Do. ...	Do. ...	4 10 0	4 4 0	
Do. ...	Cape Colony.	Do. ...	Do. ...	1 20 0	1 8 0	
Do. ...	Germany ...	Do. ...	Do. ...	15 10 0	15 3 10	
Do. ...	Turkey ...	Do. ...	Do. ...	0 16 0	0 6 5	
Do. ...	Japan ...	Do. ...	Do. ...	7 25 0	7 9 11	
Do. ...	Straits Settlements.	Do. ...	Do. ...	1 1 0	1 0 5	
Do. ...	Belgium ...	Do. ..	Do. ...	3 26 40	3 10 7	
Do. ...	France ...	Do. ...	Do. ...	0 12 0	0 4 10	
Do. ...	Hongkong...	Do. ...	Do. ...	0 10 0	0 4 0	
Do. ...	East African Protectorate.	Do. ...	Do. ...	2 30 0	2 12 0	
Do. ...	Aden ...	Do. ...	Do. ...	56 14 0	56 6 0	
Black Salt ...	Káthiáwár ...	Do. ...	Do. ...	2,381 8 40	2,381 3 2	
Common Salt ...	Bassorah ...	Kánara District.	Country Craft.	0 6 40	0 2 8	
			Total ...	17,529 16 20	17,532 13 6	
Black Salt ..	.....	.....	.....	.....	.....	Gogo ...
Goa Salt ...	.....	.....	.....	.....	.....	Kárwár ...
Do. ...	.....	.....	.....	.....	.....	Diggi ...
Do. ...	.....	.....	.....	.....	.....	Bánda ...
Do. ...	.....	.....	.....	.....	.....	Talevádi ...
Do. ...	.....	.....	.....	.....	.....	Castle Rock ...
Do. ...	.....	.....	.....	.....	.....	.....
Do. ...	.....	.....	.....	.....	.....	.....
Do. ...	.....	.....	.....	.....	.....	.....

D.

and by Land into the Bombay Presidency during the year 1912-1913.

Importations by Land.					Total of Imports by Sea and Land.	
Place of Import.	By what Route.	Mode of Conveyance.	Quantity imported.	Amount of Import Duty levied.	Quantity imported.	Amount of Import Duty levied.
			Mds. s. t.	Rs. a. p.	Mds. s. t.	Rs. a. p.
.....	.....	.....	.....	.....	17,529 16 20	17,532 13 6
Ahmedabad District.	Bhávnagar and Gogha.	Cart-loads ...	19 16 20	19 6 6		
Bombay Presidency.	Goa Frontier.	Head and bullock-loads.	2,101 12 60	2,100 1 11		
Do. ...	Do. ...	Do. ...	1,254 12 60	1,254 2 8		
Do. ...	Do. ...	Do. ...	5,923 23 0	5,923 7 4		
Do. ...	Do. ...	Do. ...	1 14 40	1 5 9		
Do. ...	Do. ...	Rail ...	2,26,561 35 20	3,26,237 4 0		
Madras Presidency.	Do. ...	Do. ...	15,024 13 0			
Mysore ...	Do. ...	Do. ...	84,645 37 0			
Calcutta ...	Do. ...	Do. ...	1 11 0			
		Total ...	3,35,533 15 40	3,35,535 12 2	3,35,533 15 40	3,35,535 12 2
		Grand Total ...	.....	.....	3,53,062 31 60	3,53,068 9 8

W. C. SHEPHERD,
Collector of Salt Revenue.

APPENDIX E.

Statement showing the quantity of each description of Salt imported and delivered from Salt Works in the Bombay Presidency during the years 1911-12 and 1912-13.

Description of Salt.	1911-1912.		1912-1913.		Remarks.
	Quantity.	Amount realised.	Quantity.	Amount realised.	
	Mds. s. t.	Rs. a. p.	Mds. s. t.	Rs. a. p.	
Barágra Salt ...	28,86,931 20 0	30,05,037 0 0	27,55,898 20 0	26,95,585 0 0	
Sea Salt ...	1,01,06,139 8 0	92,85,360 12 3	98,14,847 34 20	87,42,534 11 8	
Table Salt, Packing and Common Salt.	14,535 12 37	14,535 12 11	15,148 7 60	15,151 10 4	
Bhávnagar Black Salt (Sanchal).	2,165 25 60	2,165 10 3	2,400 24 60	2,400 9 8	
Total ...	1,30,09,771 26 17	1,23,07,099 3 5	1,25,88,295 6 60	1,14,55,671 15 8	

APPENDIX F.

Details of Issues of Salt from different sources of supply during the years 1911-12 and 1912-13.

	Full Duty.		Nominal Duty.		Fees.		Total.	
	1911-1912.	1912-1913.	1911-1912.	1912-1913.	1911-1912.	1912-1913.	1911-1912.	1912-1913.
	Mds. s.	Mds. s.	Mds.	Mds.	Mds. s.	Mds. s.	Mds. s.	Mds. s.
Barágra Salt ...	28,85,400 0	27,54,367 0	...	...	1,531 20	1,531 20	28,86,931 20	27,55,898 20
Sea Salt ...	89,15,574 10	85,47,121 10	7,59,310	8,54,852	85,911 30	77,360 25	97,60,796 0	94,79,333 35
Imported Salt ...	3,62,044 6	3,53,062 32	...	...	...	...	3,62,044 6	3,53,062 32
Total ...	1,21,63,018 16	1,16,54,550 42	7,59,310	8,54,852	87,443 10	78,892 5	1,30,09,771 26	1,25,88,295 7

W. C. SHEPHERD,
Collector of Salt Revenue.

APPENDIX G.

Statement showing the average market prices of Salt in each District of the Bombay Presidency during the financial years 1909-10, 1910-11, 1911-12 and 1912-13.

District.	1909-10. Duty Re. 1.	1910-11. Duty Re. 1.	1911-12. Duty Re. 1.	1912-13. Duty Re. 1.
	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
Bombay	2 7 0	2 5 1	2 2 0	2 3 2
Ahmedabad	1 8 2	1 8 2	1 8 2	1 8 2
Kaira	1 8 2	1 8 2	1 8 2	1 8 2
Panch Mahals	1 9 7	1 9 7	1 9 7	1 9 7
Broach	1 9 10	1 10 0	1 10 0	1 10 0
Surat	1 8 2	1 8 8	1 8 0	1 7 9
Thána	1 10 11	1 11 8	1 11 8	1 11 8
Kolába	1 12 7	2 0 3	1 12 0	1 10 7
Ratnágiri	1 12 6	2 1 1	1 11 4	1 13 8
Kánara	2 1 8	2 0 10	2 0 5	1 15 0
Násik	1 8 8	1 11 3	1 12 3	1 14 10
Khándesh, West	1 13 3	1 13 8	2 4 4	2 2 8
Khándesh, East	2 8 3	2 7 5	2 5 10	2 4 0
Ahmednagar	2 4 9	2 5 6	2 6 10	2 5 11
Sholápur	2 2 4	2 2 0	2 2 8	2 3 7
Poona	1 8 9	2 2 2	2 2 10	2 2 4
Sátára	2 0 10	2 0 0	2 1 6	2 1 8
Belgaum	1 15 0	1 14 10	1 15 10	1 13 5
Dhárwár	1 14 4	1 14 3	1 15 1	2 2 0
Bijápur	1 14 0	1 15 3	2 0 6	1 15 9

W. C. SHEPHERD,
Collector of Salt Revenue.

APPENDIX H.

Statement showing Details of Receipts and Expenditure of the Salt Department in all its Branches for the year 1912-1913, contrasted with those of the year 1911-1912.

Receipts.

Items.	1912-1913.	1911-1912.
SALT REVENUE.	Rs. a. p.	Rs. a. p.
IMPERIAL.		
Customs Duty on Salt—		
Import Duty by Sea	17,532 13 6	16,677 2 10
Do. by Land	3,35,535 12 2	3,45,366 12 7
Proceeds of Sale of Government Salt—		
Barágra Salt	5,46,907 7 10	5,88,652 9 7
Proprietary right of Government in Salt Works—		
Ground-rent at maundage rate	1,33,537 7 5	1,37,424 13 0
Ground-rent (Bulsár Salt)	16,424 15 10	18,053 6 11
Do. (Konkan Salt Works credited to Land Revenue)	249 3 5	249 3 5
Farms of Government Salt Works	44,746 0 0	45,837 0 0
Other Salt (cost price on salt supplied to fish-curers)	27,518 8 11	32,575 9 0
Excise Duty on Government Salt	.....	.....
Do. on Permits issued	1,11,02,603 6 0	1,19,33,069 10 0
Do. at nominal rates	13,232 2 6	11,985 10 0
Single and double duty (on excesses discovered on examination and by weighment at place of Import)	4,760 15 11	4,714 7 4
Fines and Forfeitures	850 12 5	1,049 15 8
Miscellaneous—		
Overtime Work Fees	17,921 13 5	16,908 12 0
Contribution from Port Funds towards cost of Coast-guard Establishment	10,000 0 0	10,000 0 0
Cost of Establishment recovered from Salt-farmers	3,317 6 2	2,663 8 5
Recovery of Salt Agents' Bagging and Sewing charges	1,26,670 8 6	1,28,595 0 1
Recovery of clothing charges	3,893 7 3	8,955 11 2
Other Items	9,026 1 1	12,654 13 11
Total, Imperial ...	1,24,14,748 14 4	1,33,15,434 1 11
PROVINCIAL.		
Sale-proceeds of forms, etc. (credited to XXIII —Stationery and Printing)	314 5 8	266 7 9
Grand Total, Salt Revenue ...	1,24,15,063 4 0	1,33,15,700 9 8

APPENDIX H—*continued.*

Expenditure.

Items.	1912-1913. Rs. a. p.	1911-1912. Rs. a. p.
SALT, IMPERIAL.		
Superior Supervising Establishment—		
Pay, including Exchange Compensation ...	1,24,589 6 7	1,34,231 12 8
Travelling Allowance	15,126 11 3	15,733 5 8
Tentage	2,043 5 8	1,846 8 5
Subordinate Establishment—		
Bonus Allowance	144 15 5	34,728 14 11
Pay, including Exchange Compensation Allowance	10,98,743 11 11	10,75,034 3 1
Plague Allowance	384 5 10	1,233 14 4
Travelling Allowance	58,272 5 4	58,014 7 1
House Rent Allowance	4,126 14 0	2,770 15 8
Horse Allowances	11,555 11 1	6,652 5 6
Grain Compensation Allowance	77,746 2 9	34,760 9 11
Local Allowance	10,309 1 4	10,420 5 9
Contingencies—		
Epidemic Charges	1 8 0	140 14 3
Service Stamps and Bearing Postage and Telegram Charges	10,055 2 0	10,684 2 6
Purchase of Books	229 6 0	272 7 0
Do. of Land and Compensation for Land	650 13 8	810 8 0
Do. of Tents	.....	382 1 0
Do. of New Boats	400 0 0	1,980 0 0
Rents	6,984 1 2	10,027 0 9
Rates and Taxes	1,869 10 10	2,443 12 6
Prizes for best Salt manufactured at Khárághoda	600 0 0	600 0 0
Clothing to Lascars	1,615 0 0	1,065 0 0
Boat Stores and Repairs	33,783 11 11	34,753 14 11
Rewards in Salt and Customs cases	3,445 8 2	3,880 6 10
Petty construction	92,383 9 4	62,152 10 6
Peons' clothing (Táluka Offices)	23,081 13 0	63,184 12 9
Arms and Accoutrements	7,111 3 1	313 11 1
Boat Allowance	16,621 1 0	16,834 6 1
Overtime Work Fees	18,185 14 6	18,258 6 3
Salt Purchase and Freight on account of Barágra Salt	4,46,873 9 9	4,52,289 8 10
Do. of removal of Salt to Fish-curing Yards	17,335 10 11	20,790 4 9
Cost of laying rails on the Udu Salt Works ...	18,743 7 0	59,670 12 0
Khárághoda Dispensary Charges	712 4 0	152 3 4
Commission on Sale of Barágra Salt	15 10 0	15 10 0
Salt Agents' Bagging and Sewing Charges ...	1,55,976 6 6	1,06,117 0 1
Scales and Weights	1,408 6 10	1,661 14 7
Mapping charges	4 0 6	7 3 6
Supply of Medicines	515 13 7	1,300 5 8
Carriage of Tents and Records	2,766 10 4	3,103 0 3
Supply of Water	7,179 14 3	8,335 12 9
Peons' Uniforms and Belts (Huzár Offices) ...	231 10 9	530 2 7
Petty Repairs	12,600 14 4	12,959 1 10
Petty Supply	6,001 15 1	6,344 0 1
Purchase of Carpets	687 3 9	791 15 9
Purchase of furniture	2,902 8 0	1,994 0 0
Purchase of Lead buttons	1,016 1 6	1,223 9 3
Conveyance of Horses	500 2 0	.....
Remittance of Treasure	298 14 3	332 10 9
Conveyance of Confiscated Salt, etc.	5 6 0	12 0 9
Monsoon Weather Fences	10,341 2 8	10,316 9 3

APPENDIX H—*concluded.*

Expenditure—*continued.*

Items.	1912-1913.	1911-1912.
	Rs. a. p.	Rs. a. p.
SALT, IMPERIAL—*continued.*		
Contingencies—*continued.*		
Gam Kharach Allowance	1,098 0 0	1,096 13 0
Destruction of Salt	7 8 0	8 4 0
Miscellaneous	147 0 8	624 14 8
Advertisement charges	6 6 0	325 15 0
Telephone charges	250 0 0	.....
Total, Salt ...	23,13,717 12 6	22,93,165 4 11
Deduct amount debitable to "4—Opium" as per Government Resolution, Revenue Department, No. 6639, dated 17th August 1905	.....	440 9 11
	23,13,717 12 6	22,92,724 11 0
Deduct amount not subject to division—		
Expenditure of the Chief Account Office ...	57,397 4 1	58,189 6 11
Salt Purchase and Freight	4,64,209 4 8	4,73,079 13 7
Net amount	17,92,111 3 9	17,61,455 6 6
Deduct one-tenth debitable to Customs	1,79,211 2 0	1,76,145 8 8
Net nine-tenths debitable to Salt	16,12,900 1 9	15,85,309 13 10
Net debitable to Salt	21,34,506 10 6	21,16,579 2 4
Stationery and Printing	9,586 3 2	9,727 2 2
Excise duty on Salt refunded	71,344 6 1	47,988 8 0
GRAND TOTAL, SALT EXPENDITURE ...	22,15,437 3 9	21,74,294 12 6

APPENDIX I.

Statement showing Transactions, Credit and Cash, during the past three years.

	1910-1911.		1911-1912.		1912-1913.	
	Quantity.	Duty realizations.	Quantity.	Duty realizations.	Quantity.	Duty realizations.
	Mds. s. t.	Rs. a. p.	Mds. s. t.	Rs. a. p.	Mds. s. t.	Rs. a. p.
1. Quantity issued and duty recovered in cash during the year	98,30,869 15 0	98,30,839 6 0	1,07,12,547 30 0	1,07,12,547 12 0	99,44,817 25 0	99,44,817 1) 0
2. Quantity issued on credit bonds during the year, but the duty on which remained to be recovered in the following year ...	6,83,259 5 0	.....	6,71,958 0 0	.....	8,19,035 5 0	.....
3. Quantity remaining unissued at the end of the preceding year and issued in the year, duty on which was realized and accounted for in that year	6,12,898 10 0	.....	4,16,468 20 0	.....	5,37,605 20 0	.....
4. Duty on quantity issued on credit bonds in the preceding year recovered in the year	.....	7,56,677 14 0	.....	6,83,259 2 0	.....	6,71,958 0 0
5. Duty realized in the year, but quantity not issued until after expiry of the year	.....	4,12,736 4 0	.....	5,31,321 0 0	.....	4,77,009 8 0
6. Duty realized for salt remaining unissued on credit bonds, duty having been realized in the year before issue	.....	4,357 4 0	.....	5,941 12 0	.....	8,819 4 0
Total ...	1,11,27,026 30 0	1,10,04,640 12 0	1,18,00,974 10 0	1,19,33,069 10 0	1,13,01,458 10 0	1,11,02,603 6 0

W. C. SHEPHERD,
Collector of Salt Revenue.

APPENDIX J.

Statement showing the operations of the Fish-curing Yards in the Bombay Presidency for the years 1911-1912 and 1912-1913.

No.	Name of Yard.	Year.	Quantity of Fish brought to be cured.	Quantity of Salt issued.	Quantity of Fish removed.	Percentage of Fish to each maund of Salt.	Expenditure including cost of construction, removal, &c., of Yards.	Receipts. Amount realized by sale of Salt.	Miscellaneous receipts.	Stock of Salt at the close of the year.	Value of Salt in Stock at the close of the year at cost price.	Total.
	Ratnágiri Range.		Mds. s.	Mds. s.	Mds. s.		Rs. a. p.	Rs. a. p.	Rs. a. p.	Mds. s.	Rs. a. p.	Rs. a. p.
1	Borya	1912-13	5,094 0	1,698 0	3,839 20	3·	1,475 1 6	742 14 0	1 0 0	1,396 16½	606 8 11	1,350 6 11
		1911-12	5,388 0	1,808 20	4,039 0	2·97	1,332 0 9	791 3 6	1 2 0	2,093 11½	918 0 0	1,710 5 6
2	Jaigad	1912-13	10,929 30	3,640 20	8,191 20	3·	2,304 12 9	1,592 11 6	.....	2,624 4	697 0 5	2,289 11 11
		1911-12	13,013 20	4,004 20	9,010 5	2·27	2,568 12 0	1,751 15 6	.....	3,523 35	954 6 1	2,706 5 7
3	Varoda	1912-13	1,492 5	497 0	1,053 29	3·	604 11 9	217 7 0	0 14 0	373 0	108 4 8	326 9 6
		1911-12	1,688 20	529 20	1,191 15	3·	543 11 8	231 10 6	0 14 0	881 20	251 5 11	483 14 5
4	Kalbadevi	1912-13	2,625 0	875 0	1,973 10	3·	1,203 3 0	382 13 0	1 6 0	1,578 24	411 1 6	795 6 6
		1911-12	4,261 10	1,421 0	3,192 25	2·99	1,475 14 6	621 11 0	0 7 0	1,685 ·8	438 13 2	1,060 15 2
5	Ratnágiri	1912-13	33,854 35	10,835 0	24,633 20	3·03	4,922 13 0	4,740 5 0	4 1 0	4,671 2	1,240 12 0	5,985 2 0
		1911-12	38,465 0	12,317 0	27,476 30	3·	4,899 7 2	5,388 11 0	1 12 0	3,738 30	1,012 8 2	6,402 15 2
6	Purnagad	1912-13	3,837 0	1,279 0	2,919 20	3·	830 2 8	559 9 0	1 10 0	770 27	204 11 1	765 14 1
		1911-12	2,661 0	887 0	1,995 30	3·	733 13 0	388 1 0	0 12 0	872 23	231 10 2	620 7 2
7	Jaitápur	1912-13	12,589 20	4,196 20	9,561 5	3·	2,474 1 4	1,695 15 6	70 0 0	3,219 21	784 13 2	2,690 11 8
		1911-12	10,281 0	3,427 0	7,695 35	3·	3,702 2 6	1,499 5 0	3 4 0	2,159 0	519 8 2	2,022 1 2
8	Vijiádurg	1912-13	7,951 10	2,768 0	5,942 22	2·85	1,846 4 8	1,219 12 0	4 7 0	1,883 25	484 4 2	1,678 7 2
		1911-12	7,975 20	2,673 0	5,882 35	2·98	1,656 6 1	1,169 7 11	1 1 0	1,927 12	463 12 1	1,634 5 0
9	Mumbri	1912-13	2,815 20	938 20	2,111 25	3·	1,950 7 8	410 9 6	.....	831 31	364 12 6	775 5 11
		1911-12	3,646 20	1,215 20	2,734 35	3·	1,755 3 0	551 13 6	.....	946 10	413 15 9	965 12 3
10	Mithbao	1912-13	2,670 0	890 0	2,002 10	3·	1,248 7 0	389 5 0	.....	673 27½	294 11 10	684 1 10
		1911-12	2,853 0	951 0	2,139 25	3·	1,412 15 0	416 1 0	.....	1,562 22½	683 10 0	1,099 11 0
11	Sarjekot	1912-13	4,884 0	1,445 20	3,664 5	3·38	1,513 0 3	632 6 6	.....	1,428 ½	624 12 1	1,257 2 7
		1911-12	5,247 0	1,759 0	4,075 35	2·99	1,265 4 0	769 9 0	.....	904 7	395 9 3	1,165 2 3
12	Málwan	1912-13	15,040 0	4,011 0	11,296 35	3·72	3,353 10 5	1,767 15 0	.....	3,263 3	1,429 13 6	3,197 11 6
		1911-12	16,615 20	4,921 0	13,444 30	3·38	3,599 10 11	2,152 15 0	.....	3,652 17	1,597 15 0	3,750 14 0
13	Devbág	1912-13	14,576 20	4,562 20	10,948 15	3·21	2,798 14 6	1,996 1 6	.....	1,666 3	729 14 6	2,725 0 0
		1911-12	14,796 20	4,614 0	11,171 0	3·21	3,285 14 1	2,018 10 0	.....	2,411 30	1,055 2 3	3,073 12 3
14	Achra	1912-13	2,410 20	730 20	1,810 35	3·30	980 4 4	319 9 6	.....	809 4	353 15 8	673 9 2
		1911-12	2,847 0	904 20	2,132 10	3·15	1,324 10 5	395 11 6	.....	1,545 28	676 2 10	1,071 14 4
15	Kochra	1912-13	2,949 0	982 20	2,189 0	3·	985 3 1	429 13 6	.....	866 38	211 5 2	641 2 8
		1911-12	3,073 20	1,020 0	2,461 20	3·	708 7 6	446 4 0	.....	625 11	146 8 9	592 12 9
16	Vengurla	1912-13	8,410 0	2,755 20	6,311 25	3·05	2,170 15 8	1,238 5 6	.....	3,703 30	902 12 7	2,141 2 1
		1911-12	9,561 5	3,122 0	7,347 30	3·06	2,597 7 8	1,365 14 0	.....	3,790 27	888 7 0	2,254 5 0
17	Shiroda	1912-13	1,517 35	506 0	1,138 15	3·63	943 8 4	221 6 0	10 2 1	1,249 21	331 10 3	563 2 4
		1911-12	4,215 20	1,402 0	3,149 0	3·	818 8 0	613 6 0	.....	1,119 36	289 3 5	903 9 5
	Total, Ratnágiri Range.	1912-13	1,32,646 35	42,661 0	99,575 31	3·05	30,685 6 11	18,697 0 0	93 10 1	30,990 37½	9,750 1 9	28,540 11 10
		1911-12	1,43,489 15	46,976 20	1,08,019 0	3·05	34,027 3 3	20,552 4 5	2 4 0	33,444 37½	10,936 10 0	31,488 2 5
	Kánara Range.											
18	Majali	1912-13	8,414 7	2,295 20	6,893 10	3·7	1,823 6 0	1,004 4 6	10 8 0	1,620 24	709 0 2	1,723 12 8
		1911-12	7,109 21	2,054 20	5,532 23	3·5	901 0 6	898 18 6	15 12 0	1,147 12	234 13 5	1,149 6 11
19	Belikhol	1912-13	7,533 20	2,391 0	6,059 0	3·17	1,838 10 9	1,041 11 0	2 4 0	1,617 23	621 3 0	1,664 2 0
		1911-12	9,145 5	2,861 0	7,086 11	3·2	1,889 1 0	1,351 11 0	2 4 0	2,040 37	497 1 11	1,851 0 11
20	Bingi	1912-13	910 20	288 0	735 20	3·4	440 14 5	116 6 0	.....	930 27	401 1 0	527 7 0
		1911-12	1,436 0	427 20	1,096 20	3·4	225 6 4	187 0 6	.....	610 38	122 15 3	309 15 9
21	Chendia	1912-13	2,310 25	610 0	1,779 17	3·78	780 2 11	286 14 0	.....	1,166 13	510 4 3	777 2 3
		1911-12	3,489 6	1,050 0	2,646 8	3·3	552 6 0	459 6 0	.....	1,178 13	238 1 11	697 7 11
22	Kodar	1912-13	8,194 0	2,666 20	6,191 0	3·07	2,017 5 5	1,166 9 6	.....	2,099 34	870 4 11	2,045 14 5
		1911-12	19,577 30	6,514 20	13,301 30	3·01	1,975 9 1	2,850 1 6	0 12 0	1,135 19	282 1 11	3,982 15 5
23	Harwada	1912-13	5,172 20	1,455 0	4,361 30	3·6	1,029 7 11	696 9 0	0 12 0	1,813 30	574 12 3	1,212 1 3
		1911-12	15,020 20	3,548 0	11,185 30	4·2	1,065 11 6	1,552 4 0	.....	853 22	167 8 2	1,719 12 2
24	Keni	1912-13	4,693 25	1,359 0	3,816 8	3·7	613 2 9	550 6 0	.....	868 36	330 2 4	930 8 4
		1911-12	7,296 10	1,593 20	5,848 15	4·6	1,054 14 6	697 2 6	.....	336 20	147 3 6	844 6 0
25	Gangawalli	1912-13	7,583 0	1,565 20	5,798 20	4·8	1,010 0 10	684 14 6	30 8 0	2,276 28	906 0 11	1,711 7 5
		1911-12	5,949 0	1,969 0	4,008 20	3·02	2,036 12 7	861 7 0	.....	3,360 18	1,088 15 2	2,550 6 2
26	Tadri	1912-13	5,619 0	1,018 0	4,667 15	5·5	559 8 9	445 6 0	28 1 3	172 18	75 7 2	546 14 5
		1911-12	5,430 0	918 0	4,498 0	5·9	561 7 1	401 10 0	.....	8 12	3 10 1	405 4 1
27	Kumta	1912-13	7,298 0	1,216 0	6,079 20	6·	1,395 13 0	532 0 0	9 10 0	1,515 9½	662 14 8	1,204 8 8
		1911-12	4,655 0	781 0	3,872 23	6·	922 15 4	341 11 0	.....	1,176 13½	257 0 0	599 1 0
28	Malukurwa	1912-13	12,339 24	2,475 20	9,864 10	4·9	3,130 9 10	1,083 0 6	44 8 0	5,059 17	2,213 8 0	3 341 0 0
		1911-12	12,260 0	2,576 0	9,418 0	4·8	3,244 0 10	1,127 0 0	73 2 0	3,441 29	753 0 11	1,95. 2 11
29	Manki	1912-13	7,223 0	1,427 20	5,775 0	5·06	1,152 8 4	624 8 6	.....	1,719 1	772 1 2	1,376 9 8
		1911-12	4,727 20	935 0	3,787 0	5·1	501 8 6	409 1 0	.....	1,543 19	337 9 0	746 10 0
30	Murdeshwar	1912-13	917 0	256 0	687 30	3·6	342 4 1	112 0 0	.....	589 38½	258 1 9	370 1 9
		1911-12	2,713 20	776 20	2,034 35	3·5	284 2 4	339 11 6	.....	193 20	42 5 0	382 0 6
31	Bhatkal	1912-13	6,782 20	1,272 20	5,103 0	4·	1,063 12 5	556 11 6	13 2 0	1,745 37	763 13 6	1,333 11 0
		1911-12	6,014 0	1,473 0	4,619 20	4·1	496 14 4	614 7 0	.....	913 4	199 12 0	844 3 0
	Total of the Kánara Range.	1912-13	85,021 11	20,163 0	69,611 15	4·2	17,577 11 11	8,821 5 0	137 5 3	22,415 16	9,806 11 10	18,765 6 1
		1911-12	1,04,842 12	27,477 20	79,045 35	3·8	15,211 13 11	12,021 6 6	91 14 0	16,440 2½	4,832 8 3	16,945 12 9
	Grand Total	1912-13	2,17,668 6	62,824 0	1,69,087 6	3·5	48,263 4 10	27,518 5 0	230 15 4	53,406 13½	19,556 13 7	47,306 1 11
		1911-12	2,48,331 27	74,454 0	1,87,064 35	3·3	49,239 1 2	32,573 10 11	101 2 0	51,885 0	15,769 2 3	44,443 15 2

		Rs. a. p.
Expenditure	...	48,263 4 10
Receipts	...	47,306 1 11
Loss	...	957 2 11

W. C. SHEPHERD,
Collector of Salt Revenue.

APPENDIX K.

Statement showing Details of Cases of Salt smuggling disposed of by the Salt Department during the year 1912-1913.

Divisions.	SALT.																			
	Nature of Offence.												Mode of Smuggling.							
	Theft from Salt-works.		Smuggling foreign Salt across Frontier.		Clandestine removal of Natural Salt.		Removals from Salt-works in excess of quantities specified in Permits.		Miscellaneous.		Total.		By Head-loads.		On Animals.		In Carts.		By Boats.	
	No.	Quantity.	No.	Quantity.	No.	Quantity.	No.	Quantity.	No.	Quantity.	No.	Quantity.	No.	Quantity.	No.	Quantity.	No.	Quantity.	No.	Quantity.
		Mds. s. t.		Mds. s. t.		Mds. s. t.		Mds. s. t.		Mds. s. t.		Mds. s. t.		Mds. s. t.		Mds. s. t.		Mds. s. t.		Mds. s. t.
Northern Division.	...	...	...	.....	2	0 5 70	...	...	...	.....	2	0 5 70	2	0 5 70	...	...	...	...	...	...
Daman Frontier ...	...	...	6	0 2 45	...	...	...	...	...	.....	6	0 2 45	...	...	...	...	...	...	...	...
Total, N. D and Daman ...	...	...	6	0 2 45	2	0 5 70	...	...	...	.....	8	0 8 35	2	0 5 70	...	...	...	...	...	...
Southern Division.	8	23 25 40	...	.....	38	17 29 75	1	0 35 0	87	924 31 0	134	966 31 35	7	23 21 13	1	0 35 0	1	0 35 0	3	642 27 0
Goa Territory ...	...	...	15	26 29 33½	...	...	...	...	2	0 8 34	17	26 37 67½	11	8 1 73½	...	...	...	...	2	14 29 40
Total, S. D. and Goa ...	8	23 25 40	15	26 29 33½	38	17 29 75	1	0 35 0	89	924 29 34	151	993 29 22½	18	31 23 6½	1	0 35 0	1	0 35 0	5	657 16 40
Total ...	8	23 25 40	21	26 31 78½	40	17 35 65	1	0 35 0	89	924 29 34	159	993 37 57½	20	31 28 76½	1	0 35 0	1	0 35 0	5	657 16 40

Divisions.	SALT—*contd.*														
	Mode of Smuggling—*contd.*				How cases were disposed of.						Total estimated value of Confiscations.	Fine in lieu of confiscated Property released.	Actual produce by auction-sale of confiscated Property.	Total of two previous columns.	Fines imposed by Magistrates.	Real value of confiscated Property.	Rewards granted, if any.
	Miscellaneous.		Total.		Number of persons arrested.	Number of persons released by the Department.	Number of persons prosecuted.	Number of persons convicted.	Number of persons acquitted.	Percentage of convictions on number prosecuted.							
	No.	Quantity.	No.	Quantity.							Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
		Mds. s. t.		Mds. s. t.													
Northern Division.	...	.....	3	0 5 70	3	...	3	3	...	100·00	.....	.....	.....	.....	2 0 0	.....	1 0 0
Daman Frontier ..	6	0 2 45	6	0 2 45	6	...	6	6	...	100·00	1 5 1	.....	1 2 0	1 2 0	96 0 0	1 5 1	91 0 0
Total, N. D. and Daman ...	6	0 2 45	8	0 8 35	9	...	9	9	...	100·00	1 5 1	.....	1 2 0	1 2 0	98 0 0	1 5 1	92 0 0
Southern Division.	122	97 35 23	134	966 31 35	152	18	133	130	3	97·74	486 13 1	55 0 0	10 15 6	65 15 6	373 2 0	31 10 11	249 4 0
Goa Territory ...	4	4 6 34	17	26 37 67½	25	16	9	8	1	88·88	46 2 7½	.....	12 0 6	12 0 6	14 0 0	46 2 7½	6 12 0
Total, S. D. and Goa ...	126	102 1 56	151	993 29 22½	177	34	142	138	4	97·18	532 14 8½	55 0 0	23 0 0	78 0 0	387 2 0	77 13 6½	256 0 0
Total ...	132	102 4 21	159	993 37 57½	186	34	151	147	4	97·35	534 3 9½	55 0 0	24 2 0	79 2 0	485 2 0	79 2 7½	348 0 0

W. C. SHEPHERD,
Collector of Salt Revenue.

COMMISSIONER'S REVIEW.

S. A. R. No. 1 of 1913.

Camp Poona, 18th August 1913.

Submitted to Government in the Revenue Department.

2. The financial results of the year under report and the two previous years are as follows :— Financial Results.

	1912-13.	1911-12.	1910-11.	Annual average. 1905—1910.
	Rs.	Rs.	Rs.	Rs.
Gross receipts	124 lákhs.	133 lákhs.	123 lákhs.	137 lákhs.
Net receipts	102 „	111·4 „	102·5 „	118 „
Expenditure exclusive of refunds ...	21·5 „	21·25 „	20 „	18 „
Percentage of charges to net receipts	21 „	19 „	19·6 „	15·5 „

3. The quantities of Salt removed from the works in each of the last two years were as shown below :— Removals.

	Full duty.	Nominal duty.	Free of duty.	Total.
	Mds. s.	Mds. s.	Mds. s.	Mds. s.
1911-12	1,18,00,974 10	7,59,310 0	87,443 10	1,26,47,727 20
1912-13... ...	1,13,01,488 10	8,54,852 0	78,892 5	1,22,35,232 15

From these figures it will be seen that there was a decrease of about 5 lákhs maunds or 4·2 per cent. in the removals of salt at full duty. This falling off is attributed to the unusually large removals in 1911-12. There was, however, an increase of about a lákh of maunds in the removals of salt on which nominal duty was payable.

4. The total quantity of Salt manufactured rose from 1,32,94,143 maunds to 1,37,43,925 maunds or by 3 per cent and this enhanced production brought the aggregate stocks in hand from 27 lákhs at the beginning to 33 lákhs at the close of the year. This stock added to the balance of 63¾ lákhs on the 30th June 1913 (against 74 lákhs on the same date in the previous year) is more than sufficient to meet the ordinary demand up to the next manufacturing season. To provide for any unforeseen increase in the demand for Barágra Salt, the Collector proposes to open during the next manufacturing season as many pans as possible in the new salt work between Khárághoda and Udu, the opening of which has been sanctioned by Government. There is every hope of the proposal being carried out as the boring experiments made by the Sanitary Engineer to Government, with a view to provide an adequate supply of drinking water in the new salt work, have recently met with success and a copious supply of water would seem to be assured. The quantity of Salt produced within the financial year 1912-13, indicates, as observed last year, that there is no danger of the margin of supply becoming too narrow for the present, and the proposed opening of additional pans during the next season ought to remove all apprehension in this direction. Manufacture.

5. The decrease in the removals of fully dutiable salt is accompanied by more than the corresponding fall in the excise duty receipts, due to the payment of duty in advance in the year 1911-12 on a large quantity of salt removed during the year under report. Unlike the year 1911-12, Receipts.

there was a decrease in the quantity of salt exported to all parts outside the Presidency, except Calcutta and Foreign Malabár (where there was a noticeable increase) due to the removals in the previous year having been in excess of the demand. The falling off of about 2½ lákhs maunds in the removals to the Madras Presidency is attributed to increased production in that Presidency and the consequent low prices which checked competition. During the year 1911-12, 72·6 per cent. of the Sea Salt manufactured near Bombay was consumed outside the Presidency, but in the year under report the proportion fell to 68·3 per cent.

Expenditure.

6. The total expenditure of the Department has increased very slightly. Most of the items which show variations have been mentioned in paragraph 27 of the report. In the review of the previous year's report it was stated that the expenditure had been steadily rising for some years and that careful enquiry would be made with a view to ascertain how far the increase was inevitable. A report on this point has already been submitted to Government, in which the increase of expenditure was examined and shown to be susceptible of satisfactory explanation.

Offences.

7. Since 1905-06 there has been a continuous fall in the number of offences under the Salt Act, but during the year under report there was a large increase in the number of cases detected in the Southern Division. Most of the cases were, however, trivial ones, of illicit possession and removal of salt-earth.

Fish-curing Yards.

8. The fish-curing yards were worked at a loss of Rs. 957 against Rs. 795 in the previous year, owing partly to the unfavourable fishing season and partly to the reduction in the cost price of salt issued to fish-curers. The advisability of raising the present selling price of annas seven per maund to the old rate of annas eight will be considered after watching the results of the current year. The question of the improvement of the existing fish-curing yards on lines suggested by Mr. Lucas was fully inquired into, but the proposals made in this connection were found to be not worth the expense which they would entail, and with the approval of Government the matter has been dropped.

Consumption and Prices.

9. The average rate of consumption of salt per head throughout the Presidency fell from 13·2 to 12·7, while the variations in the average selling price (which was arrived at this year by a uniform process of calculation in all districts) in most of the districts of the Presidency, except Ratnágiri and Násik, were insignificant and due to the ordinary trade fluctuations. The rise in Násik is attributed to a combination among the retail vendors to maintain the price at a high level and in Ratnágiri to the high range of prices which ruled during the last monsoon owing to insufficient stocks in the market.

Concluding Remarks.

10. During the Commissioner's last inspection of the Pritchard Salt-Works and the Northern Frontier Preventive line the very serious prevalence of malaria, during and after the rains, in the Salt Department village of Khárághoda came under his notice. To combat this evil, he has suggested a malarial survey on a scientific basis, and for this purpose the Surgeon-General with the Government of Bombay has been asked to obtain, if possible, the services of a trained mosquito expert. A separate report on this subject will be submitted to Government in due course.

11. The Collector has curtailed the present report with the previous sanction of the Commissioner by the omission of unnecessary paragraphs and alterations in the form of some of the tabular statements.

12. The working of the Department during a somewhat uneventful year has been satisfactory.

H. O. QUIN,
Commissioner of Customs,
Salt, Opium and Abkári.

BOMBAY: PRINTED AT THE GOVERNMENT CENTRAL PRESS.

REPORT

OF THE

ADMINISTRATION OF THE MINT AT CALCUTTA AND BOMBAY

FOR THE YEAR

1911-1912

CALCUTTA
SUPERINTENDENT GOVERNMENT PRINTING, INDIA
1912

Price Rupees 3 Annas 9 or 4s. 9d.

RUPEE



REVERSE



OBVERSE

EAST INDIAN RAILWAY MEDAL



OBVERSE



REVERSE

CORONATION SCHOOL CHILDREN MEDAL



OBVERSE



REVERSE

DELHI DURBAR MEDAL



REVERSE



DURBAR CLASP

DELHI DURBAR MEDAL



OBVERSE

MINIATURE DELHI DURBAR MEDAL



REVERSE



OBVERSE



REVERSE

DELHI MILITARY TOURNAMENT MEDAL



OBVERSE

Photo.-Engraved & printed at the Offices of the Survey of India, Calcutta, 1912



INSCRIPTION ROUND THE "CROWN" AT THE HEAD OF THE KING'S CHAIR.

INSCRIPTION IN THE "BALL" AT THE HEAD OF THE QUEEN'S CHAIR.

Photo-Engraved & printed at the Offices of the Survey of India, Calcutta, 1912

REPORT ON THE WORKING OF THE CALCUTTA MINT.

No. 2137, dated 27th June 1912.

From—Lieutenant-Colonel W. G. R. Cordue, R.E., Master of the Mint,

To—The Secretary to the Government of India, Finance Department.

I have the honour to submit the Annual Report for the Calcutta Mint for the year 1911-12 together with the prescribed statements.

2. Captain G. H. Willis, M.V.O., M.I.M.E., R.E., officiated as Mint Master of this Mint up to 19th October 1911, from which date I have been in charge.

GOLD.

3. *Receipts.*—Mint certificates to the total value of Rs. 5,94,73,830 were issued for sovereigns tendered during the year and were in excess of the previous year's receipts by Rs. 3,56,81,670. Details of these receipts are noted below :—

Tale.	Classification.	Value in Rupees.
3,923,132	Sovereigns of current weight	5,88,46,980
41,790	Sovereigns of short weight or not more than 3 grains less than standard weight, nominal value	6,26,850
3,964,922		5,94,73,830

4. Under the authority of the Comptroller General uncurrent sovereigns and half sovereigns to the value of Rs. 7,965 held in the Mint Gold Coin Account and Rs. 48-6-6 held in the Mint Gold Bullion Account were melted down for the purpose of manufacturing medals, etc., and gold bullion to the value of Rs. 13,273 was purchased in the local market to provide medals for the Imperial Durbar at Delhi.

5. The Mint also received gold bullion and coin from treasuries and other Government Departments amounting in value to Rs. 5,696, as detailed below :—

Tale.	Classification.	Value in rupees.
	Received from Treasuries.	
19	Sovereigns of short weight or not more than 3 grains less than standard weight, nominal value	285
1	Half sovereign of short weight or not more than 3 grains less than standard weight, nominal value	7
74	Defective sovereigns unfit for re-issue, nominal value	1,110
51	Sovereigns of reduced weight or more than 3 grains less than standard weight, bullion value	721
	Other Government Departments.	
	Bullion	3,573
		5,696

SILVER.

6. *Receipts.*—The receipts of uncurrent silver coins during the year amounted, in nominal value, to Rs. 1,52,20,884 and showed an increase of Rs. 14,75,795 as compared with the transactions of the previous year. The remittances after examination were classified as follows :—

			In thousands of rupees.
Government rupees and half-rupees of		1835	578·6
Ditto	ditto	1840 (1st issue)	1,396·0
Ditto	ditto	1840 (2nd „)	4,505·2
Ditto	ditto	of shroff marked, defective and dumb coins	808·6
Ditto	ditto	worn	4,828·2
Ditto	ditto	reduced	35·8
Ditto	ditto	of 1911	3,068·5
			15,220·9

7. The above figures include the uncurrent and withdrawn coins amounting to Rs. 58,950 eliminated during the course of examination from the special remittances sent to the Mint from the Currency Offices of Calcutta, Cawnpore, Madras, Lahore and Rangoon for the annual rupee census.

8. *Coinage.*—The total silver coinage executed by the Mint during the year under review was 25,089,004 pieces valued at Rs. 1,55,00,111 as compared with 36,196,505 pieces valued at Rs. 1,38,07,253 in the year 1910-11. The coinage, which included 43,00,000 whole rupees bearing the effigy of His Majesty the King and the year 1911, was executed entirely from the receipts of withdrawn and uncurrent silver coins.

9. *Percentage of good coins.*—The percentages obtained from weight of metal operated on compare satisfactorily with those of previous years. They are as follows :—

	Weight of Ingots rolled.	Percentages of good coins.
Rupees	156·47	70·2
Half-rupees	18·34	70·1
Quarter-rupees	9·51	68·5
One-eighth-rupees	12·61	67·4

10. *Pyx trials.*—The results of the pyx trials furnished by the Assay Master in his attached report show that the weight and fineness of the silver coinage was maintained at its proper standard.

11. *Silver operative losses.*—The following balance statement shows the results of silver coinage operations for the year under review :—

	R		*R.*
Opening balance	24,79,290	Issues	1,58,62,486
Receipts	1,50,74,315	Closing balance	16,77,625
		Operative loss	13,494
Total	1,75,53,605	Total	1,75,53,605

This loss gives a rate of 86·7 per lakh of standard tolas coined.

12. The loss was reduced by the recovery of silver from floor sweepings of the Bullion Office which amounted to Rs. 341, thus reducing the rate of loss to 84·5 per lakh.

13. It may be further noted that the coinage being entirely confined to the recoinage of uncurrent silver coins, the loss shown above includes an estimated weight of 7,444 tolas of dirt (calculated at 65 tolas per lakh on 11,452,416 tolas uncurrent coin).

BRONZE AND COPPER.

14. *Receipts.*—There was no purchase of copper for bronze coinage, the stock held in the Mint together with maunds 1,639 of worn copper coins withdrawn from circulation during the year being sufficient to meet coinage requirements.

15. *Coinage.*—In the year under review the Mint executed a total bronze coinage of 63,443,524 pieces valued at Rs. 9,25,625 as compared with 80,668,421 pieces valued at Rs. 9,45,124 in the year previous.

16. In addition to this the Mint coined 4,748,000 pieces of Ceylon copper coins valued at Rs. 39,920, the weight of metal used being met by a remittance of 5 cent pieces by the Ceylon Government.

17. Under Finance Department letter No. 7432-F., dated 21st December 1911, the Mint also coined 504,500 copper pieces of "Amman Cash" valued at Rs. 1,971, for the Pudukottai Durbar.

18. Details of these coinages are shown in statement II attached to this report.

19. The result of the weighment and analysis of the bronze coins sent to the Assay Master proved that the coinage was within legal standard limits with regard to weight and composition.

20. *Operative losses.*—The operative losses written off the accounts for the year under report in connection with bronze coinage are as follows :—

Melting	loss	mds.	26·55	at ·34	per 100 mds.	melted.
Coining	„	„	11·72	at ·16	do.	of new coins coined.

21. The operative loss on the coinage for the Ceylon Government was maunds 42·30 and for the Pudukottai Durbar maund 1.

MISCELLANEOUS.

22. The total silver coinage shown in statement II of this report bearing His Majesty's effigy on the obverse amounted to—

Rupees	10,300,000	pieces.
Half-rupees	1,136,000	„
Quarter-rupees	760,000	„
One-eighth-rupees	4,800,000	„

23. *Silver balances.*—The average daily silver balance amounted to Rs. 20,38,535 ; on 31st May 1911 it fell to a minimum of Rs. 5,64,986 and on 9th November 1911 it rose to its maximum, *viz.*, Rs. 47,32,952. There was a gradual rise in the silver balance owing to the cessation of coinage pending the preparation of new dies during August to October 1911.

24. The Medal, Die and Engraving Departments were kept extremely busy during the year ; the bulk of the work was in connection with the Imperial Delhi Durbar held on 12th December 1911, work for the Army Temperance Association and other miscellaneous orders being meanwhile practically held in abeyance.

25. This Mint had the unique privilege of manufacturing two thrones and footstools for the use of their Majesties at the Imperial Durbar.

26. These thrones, an illustration of which is appended to this report were facsimiles of two wooden thrones of Georgian design in the possession of the Government of India. They were manufactured in solid silver and gilded throughout. The total net weight of the metal in the chairs and footstools amounted to 1,911 lbs. avoir. ; Rs. 96,000 of old rupees being melted down to produce the castings.

27. The casting, chasing and engraving work was done entirely in the Mint under the supervision of Captain G. H. Willis, M.V.O., M.I.M.E., R.E., Acting Mint Master. The upholstery was supplied by a local firm of

jewellers. The cost of manufacture, excluding the cost of upholstery which amounted to Rs. 1,750, was Rs. 3,000. The first casting was begun in July 1911 and the chairs were ready for despatch to Delhi on 25th November of that year.

28. The Mint was also engaged during the year in the preparation of new medals and coins ; specimens of these are illustrated on the frontispiece.

29. The obverse punch for the new coinage bearing the image and superscription of King George V was received from the Royal Mint, London, in July 1911, and in November and December rupees and fractional silver coins were struck and supplied to treasuries so that the first issue should be made to the public on Durbar day, the 12th December. Soon after that date complaints began to be made by various members of the public about the shape of the elephant depicted on the insignia of one of the orders on the obverse of the rupee. The dies were therefore slightly altered and in the 1912 coins the figure of the elephant is more distinct and correct in outline. The reverse design has already been alluded to in last year's report.

30. At the request of the Agent of the East Indian Railway 6,000 medals were struck from dies prepared and designed in the Mint for distribution among the staff employed in safeguarding the passage of the special trains of their Imperial Majesties. The medals were struck in aluminium-bronze.

31. Under orders of Government contained in letter No. 4177-F., dated 8th July 1911, this Mint prepared punches and matrices for a Durbar medal for distribution among the school children in India. The designs were prepared by Mr. F. K. Wezel, Engraver of the Mint, and the punches made under his immediate supervision. The medals were however struck at the Bombay Mint.

32. The Government of India in letter No. 5716-F., dated 15th September 1911, ordered a commemorative Durbar medal to be struck at the Calcutta Mint. A punch for the obverse of the medal was sent out by the Royal Mint for the purpose, but was found to be too small in diameter. In order to enlarge it to the required size a replica of about 3 diameters was made in soft silver, and nickel plated to make it sufficiently hard to stand the wear of the pointer of the engraving machine. From this replica a working punch of the required size was cut. The reverse was prepared from a design furnished by the Government of India. The brooches and ribbon attachment were prepared in this Mint and 200 gold and 27,000 silver medals struck.

33. For those already in possession of the Home Coronation medal and also entitled to the India medal, a clasp inscribed "Delhi" was designed and manufactured at this Mint. Miniature of the Durbar medal were also struck and up to the close of the financial year under report 1,647 medals and 254 brooches were issued.

34. The engraver also designed and prepared punches for a medal for the Military tournament held at Delhi on the occasion of the Imperial Durbar ; 15 gold, 37 silver and 32 bronze medals were struck from these dies.

35. During the year 417 war and other medals and 476 clasps were replaced by the Mint on applications received from Commanding Officers of Regiments under the control of the Northern and Eastern Circles.

36. Under the orders of the Government of India the Mint on the 9th May 1911 transferred to the Commissioners for the Port of Calcutta, 12 bighas 7 kottas 15 chittacks and 14·5 square feet of Mint land adjacent to the river. The cost of the land and buildings situated thereon paid by the Port Commissioners amounted to Rs. 7,45,670 and Rs. 74,950 respectively.

PLANT AND MACHINERY.

37. The machinery ran satisfactorily during the year with the exception of the double helical gearing of the rolling mills which continued to be a source of anxiety. The dross mills were converted from steam to electric power during the year. There were no other additions or alterations of importance. The whole of the Mint machinery is now driven by electricity.

38. *Supply of electric current.*—The records of the Mint generating station show that 438,581 B. T. units were generated during the year, the cost being as follows :—

Fuel, establishment and stores	Rs. 24,846
Depreciation at 5 per cent. on plant and 3 per cent. on buildings, and provision for pensions	15,910
TOTAL .	Rs. 40,756
The cost per unit works out to be fuel, establishment, stores	0·906 annas
Depreciation	0·581
TOTAL COST PER UNIT .	1·487 annas

The amount recovered in payment for current for fans and lights in private quarters was Rs. 1,864.

39. The accounts for the complete electrical installation were closed during the year. The final cost which amounted to Rs. 6,69,269-5-0 was accepted by the Government of India in Finance Department letter No. 1306-A., dated 28th February 1912.

REVENUE AND EXPENDITURE.

40. *Revenue, charges levied.*—The Mint realized a total revenue under charges levied on silver bullion, of Rs. 654 ; the major portion of this was received from the Photo. and Litho. Office of the Survey of India for recovery of silver from precipitate residues.

41. *Gain on coinage operations.*—The total gain credited under this head amounted to Rs. 8,891, of which Rs. 8,549 represented the gain by over standard value of uncurrent silver coins withdrawn from circulation.

42. *Cash and Transfer Receipts.*—These receipts amounted to Rs. 33,560, as compared with Rs. 53,929 in the year previous; the decrease in revenue under this head is chiefly due to a decrease in revenue realized from the sale of old stores. The apparent increase under transfers is due to the work done in connection with Public Works by the Mint.

43. *Miscellaneous Cash Receipts.*—An amount of Rs. 2,480 was brought to account, of which Rs. 1,864 represented the cost of power and light consumed by Mint officials in their private quarters.

44. *Expenditure.—Loss on coinage operations.*—The total amount shown as expenditure under this account amounted to Rs. 2,61,840. Of this amount Rs. 14,657 represented the operative loss written off the accounts during the year. Rs. 2,45,180 represents the net loss on recoinage of old silver coins withdrawn from circulation as compared with Rs. 2,62,156 in the previous year.

45. *Salaries and establishment.*—Rupees 3,09,060 was expended under this head of account as compared with Rs. 3,02,539 in the year previous.

46. *Copper and bronze used for alloy, etc.*—Rupees 1,415 was expended in the year under report as compared with Rs. 1,300 in the previous year. Of the amount thus written off Rs. 209 represented value of copper used as alloy and Rs. 1,206 value of copper and other metals used for contingent purposes.

47. *English and local stores.*—The total expenditure amounted to Rs. 82,213 showing a decrease of Rs. 34,663, the decrease being chiefly due to the expenditure in English stores which amounted to Rs. 24,960; the reason for the gross decrease may be chiefly attributed to the diminution in coinage for the year as compared with the year previous.

48. *Contingent charges.*—The slight increase of Rs. 1,552 under contingencies as compared with the previous year is fairly distributed among the minor heads of expenditure. An item of Rs. 209 for livery of peons appears in the year's expenditure under report, and the increased expenditure under

cart and coolie hire, postage and telegrams is chiefly due to the additional work in connection with the Durbar. The expenditure under miscellaneous includes Rs. 652, railway freight paid by the Mint on consignments of old scales and weight returned by Opium Factories.

49. *Pro formâ Receipts and Charges.*—On the receipt side a credit of Rs. 1,42,255 has been shown which includes the approximate credit at 15 per cent. on the value of new bronze coins manufactured, to cover working expenses.

On the charge side Rs. 3,60,793 represents the interest on Capital account and the Bullion and store balances held in the Mint at the close of the year.

50. *Capital account.*—Rupees 9,267 represents the total value of machinery brought to account and transferred to the capital expenditure. This account has been also swelled by the expenditure incurred on Mint buildings and has been reduced by the value of the transfer of a portion of Mint land and the buildings thereon to the extent of Rs. 8,20,620.

COUNTERFEIT COINS.

51. The total number of coins examined by the Assay Master during the year was 442 as compared with 344 in the year previous; of these 170 were genuine, 7 struck counterfeits, 205 castings, 49 base castings and 11 doubtful as to their genuineness or otherwise.

52. Of the total number of coins examined 16 were for the Mint, the remainder were received from Magistrates, police officers, etc.

53. The examination of these coins resulted in 1,003 assays being made, and the finenesses ranged from 19·7 to 977·1 per mille.

54. Of the 16 counterfeit coins examined for the Mint the following are deserving of notice. Three were struck coins of good execution and contained silver to the extent of 938·0, 949·9 and 951·7 per mille.

55. Among the 442 coins received for examination, 9 were Kabuli coins on which no opinion was expressed.

56. Among the remittances of uncurrent silver coins received and examined by the Mint 3,125 counterfeit rupees, 82 half-rupees, 279 quarter-rupees and 597 one-eighth-rupees were eliminated; showing a decrease on the amounts detected in the previous year.

57. A noticeable decrease occurs in the receipts at the Mint of counterfeit coins under the provisions of Article 580, Civil Account Code, as also coins received for examination and report.

58. The number of counterfeit silver coins cut at the various Treasuries and Railway centres under the provisions of Article 590 (*d*), Civil Account Code, and Government of India Resolution No. 6192, dated 10th December 1901, has increased to a large extent as compared with the previous year.

59. The value of silver recovered from counterfeit coins received from all sources and credited to Government during the year under review amounted to Rs. 265.

OFFENCES AGAINST COINAGE.

60. The usual statement of offences against the coinage is appended to this report.

61. It will be seen that there has been a considerable decline in the convictions in the year under review. The decline is most noticeable in Madras, Eastern Bengal and Assam, Punjab, Burma and the North-West Frontier Provinces.

62. The ratio of the number of persons convicted to that of the number of persons brought to trial was 56·5 as compared with 60·3 of the preceding year.

Statement No. I of 1911-12.

Account of Total Revenue and Expenditure of the Calcutta Mint during the year 1911-12.

	R a. p.	R a. p.		R a. p.	R a. p.	R a. p.
REVENUE.			**EXPENDITURE.**			
To Charges levied—			By Working Expenses—			
Silver—			*Silver*—			
Percentage on new rupee coinage	...		*Loss on Coinage Operations*—			
Seignorage on dollar coinage	...		Operative loss	...	14,657 5 2	
Premelting fees	508 11 2		Loss on withdrawal of uncurrent silver coins	...	2,45,179 14 10	
Assay and melting fees (Private)	145 8 6		Loss by overstandard weight and fineness of new coins issued	...	1,477 11 9	
		654 3 8	Loss by understandard value of uncurrent silver coins withdrawn from circulation	...	...	
			Other items	...	525 4 4	
						2,61,840 4 1
			Miscellaneous Charges—			
			Loss on gold melting	...	18 13 9	
			Other items	...	...	
						18 13 9
Gold—			By Salaries and Establishments—			
On bullion from Government Departments	...	5 11 8	Fixed Establishment	...	1,94,160 1 10	
			Extra Establishment and overtime pay	...	1,14,899 8 1	
						3,09,059 9 11
To Gain on Coinage Operations—			By Copper, Bronze and Nickel—			
Silver—			Used as alloy	...	208 13 11	
Gain by assay benefit	...		Used for contingent purposes	...	1,205 15 7	
Gain by understandard weight and fineness of new coins issued	...		Miscellaneous	...	...	
						1,414 13 6
Other items	342 5 11		By Local Stores—			
Gain by overstandard value of uncurrent silver coins withdrawn from circulation	8,548 9 2		Coke, coal and charcoal	...	21,736 6 6	
		8,890 15 1	Oil, grease and tallow	...	6,493 11 9	
Gold—			Acids	...	495 14 6	
Miscellaneous	...	...	Iron and brass	...	5,445 14 0	
			Metals	...	934 15 7	
			Wood for boxes	...	7,171 0 11	
			Bullion trucks, etc.	...	...	
			Electrical stores	...	1,596 7 0	
			Miscellaneous	...	14,135 13 9	
						58,010 4 0
			By Contingent Charges—			
To Cash Receipts—			Books and periodicals	...	308 4 0	
For scales, weights and other articles supplied and work done for individuals	7,335 2 10		Scales and weights	...	207 0 0	
			Cart and coolie hire	...	729 0 6	
For old stores and materials sold	3,861 12 5		Telegrams and postage	...	973 12 0	
			Inspection of boilers	...	76 0 0	
Miscellaneous	16 13 0		Rents, rates and taxes	...	40,959 10 0	
		11,213 12 3	Electricity and gas	...	392 12 3	
			Freight on Europe stores	...	271 5 0	
			Furniture	...	184 5 0	
			Livery of peons	...	208 12 0	
			Miscellaneous	...	4,302 15 9	
						48,563 12 6
Carried over	...	20,764 10 8	Carried over	...		6,78,907 9 9

Account of Total Revenue and Expenditure of the Calcutta Mint during the year 1911-12—*contd.*

REVENUE.	R a. p.	R a. p.	EXPENDITURE.	R a. p.	R a. p.	R a. p.
Brought forward .		20,764 10 8	Brought forward .			6,78,967 9 1
To Transfer Receipts—			By Transfer Charges—			
For scales, weights and other articles supplied and work done for Government Departments . . .	20,020 10 6		Coin bags	...	3,051 8 0	
			Landing and Shipping .	...	1,379 4 8	
			Articles supplied by other Departments . . .	...	2,696 2 0	
For war medals for Military Department . . .	2,137 4 5					7,126 14 1
			By English Stores used from stock—			
Coining and incidental charges on copper coins for Colonial Governments . . .	188 5 9		Value of stores used . .	...	24,474 1 3	
		22,346 4 8	Less ½ freight charged as above	...	271 5 0	
						24,202 12 3
			P. W. D. Charges—			
			Repairs and alterations to buildings . . .	...	4,390 0 0	
To Miscellaneous Receipts—						4,390 0 0
Rents recovered from residential quarters . . .	615 7 9					
Cost of electric current consumed	1,864 4 0		Miscellaneous Charges External to Mint—			
		2,479 11 9	Stationery	...	2,855 6 0	
			Printing	...	771 0 0	
Total .	...	45,590 11 1				3,626 6 0
			Total .	...	...	7,18,253 10 3
To Balance .	...	6,72,662 15 2	Total brought down .	...	...	7,18,253 10 3
Total .	...	7,18,253 10 3	By *Pro formâ* Charges—			
			Cost of pensions and furlough allowance—			
			½ of salaries of superior servants	...	29,862 0 0	
Total brought down .	...	45,590 11 1	⅛ of salaries of inferior servants	...	192 0 0	
						30,054 0 0
To *Pro formâ* Receipts—			Interest on—			
Percentage on value of bronze coins manufactured . .	1,33,844 0 0		Mint land building and plant valued at . . .	68,59,872 0 0		
Medals for Royal Army Temperance Association .	3,216 0 0		Average silver balances .	20,38,525 0 0		
			Average bronze balance .	11,37,127 0 0		
Weights supplied to Treasury Officers	195 0 0		Store balance . . .	2,72,850 0 0		
		1,42,255 0 0			1,03,08,374 0 0	
Total .	...	1,87,845 11 1	At 3½ per cent. . . .	...	...	3,60,793 0 0
To Balance .	...	8,21,254 15 2				
Total .	...	11,09,100 10 3	Total .	...	...	11,09,100 10 3

ABSTRACT of CAPITAL ACCOUNT of the CALCUTTA MINT to the end of the year 1911-12.

	Land.	Building.	Plant.	TOTAL.		Land.	Building.	Plant.	TOTAL.
	₹	₹	₹	₹		₹	₹	₹	₹
Total expenditure on Capital Account brought forward from last year . .	20,13,346	33,93,046	24,71,160	78,77,552	Value of stores lost or destroyed .	...	...	1,650	1,650
Expenditure during the current year, P. W. D. . .	...	18,342	...	18,342	Value of buildings sold .	...	74,950	...	74,950
					Depreciation at 5% on plant and 3% on buildings .	...	99,543	1,23,476	2,23,019
Other items—									
Roturbo Pumps .	...	...	1,551		Sale of Mint land . .	7,45,670	...	...	7,45,670
Shaping machine	...	...	3,213			7,45,670	1,74,493	1,25,126	10,45,289
Weighing machine	...	...	249						
Motor starter .	...	...	94		Balance .	12,67,676	32,36,895	23,55,301	68,59,872
Benold chain .	...	...	387						
Bullion balance .	...	...	3,773	9,267					
TOTAL .	20,13,346	34,11,388	24,80,427	79,05,161	TOTAL .	20,13,346	34,11,388	24,80,427	79,05,161

No. II of 1911-12.

STATEMENT of the COINAGE of the CALCUTTA MINT for the year 1911-12.

	Tale of pieces.	Nominal value.	TOTAL. Tale.	TOTAL. Value.	REMARKS.
				R a. p.	
SILVER—					
Rupees	12,826,937	1,28,26,937 0 0			
Half-Rupees	2,292,843	11,46,421 8 0			
Quarter-Rupees	2,244,798	5,61,199 8 0			
One-eighth-Rupees	7,724,426	9,65,553 4 0			
British Dollars	.....	.....	25,089,004	1,55,00,111 4 0	
BRONZE—					
Single pice	55,918,260	8,73,722 13 0			
Half-pice	4,879,970	38,124 12 3			
Pie pieces	2,645,294	13,777 9 2	63,443,524	9,25,625 2 5	
NICKEL—					
One anna	.....	.....	.....	.....	
COPPER—					
Ceylon Cents	3,236,000	32,360 0 0			
Ceylon Half-cents	1,512,000	7,560 0 0			
Amman cash	5,004,500	1,970 11 3	5,252,500	41,890 11 3	
GRAND TOTAL	.....	.....	93,785,028	1,64,67,627 1 8	

No. III of 1911-12.

STATEMENT showing the COST of MISCELLANEOUS WORK done in the CALCUTTA MINT during the year 1911-12.

DESCRIPTION.	Amount.	Total.	REMARKS.
RECEIPTS.	R a. p.	R a. p.	
Receipts for Medals, Seals, Stamps, etc.	38,965 8 3		
Adjusting Weights	2,546 11 0		
Sale-proceeds of Treasure Trove coins	.....		
Miscellaneous	14,499 13 0		
		56,012 0 3	
EXPENDITURE.			
Engraver's Labour	4,821 14 8		
Workshop do., etc.	14,904 5 9		
Jewellers' do.	2,192 2 0		
Stores used (including gold, silver and copper)	23,372 8 11		
		45,290 15 4	
Net Profit Rupees		10,721 0 11	

No. IV of 1911-12.

STATEMENT of COUNTERFEIT COINS received at the CALCUTTA MINT, showing also those cut and broken at the TREASURIES, compiled from the QUARTERLY RETURNS furnished by TREASURY OFFICERS during the year 1911-12.

NAME OF PROVINCE.	COUNTERFEITS RECEIVED AT THE MINT.												Counterfeit coins cut at the several Indian Treasuries as per Quarterly Returns furnished by the Treasury Officers and Railway Administrations under Article 590-A (*d*), Civil Account Code, and Government Resolution No. A-6192, dated 10th December 1901.				REMARKS.
	Nominal value of remittances of the uncurrent coins received at the Mint in thousands of Rupees. (*a*)	In remittances of uncurrent coins from Treasuries.				From Treasury and other officers under Article 580, Civil Account Code, and Government Resolution No. 1004-A, dated 21st February 1901.				Received at the Mint for examination. (*b*)							
		Rs.	¼	½	⅛	Rs.	¼	½	⅛	Rs.	¼	½	⅛	Rs.	¼	½	⅛	
1	2	3				4				5				6				7
India	6,774·8	366	24	83	223	17	...	...	...	20	...	...	...	1,176	8	4	9	(*a*) Including current weight coins received for special examination.
Central Provinces	67·6	22	...	...	...	....	...	...	...	...	...	...	...	...	...	...	...	(*b*) Excluding assay office.
Burma	147·6	63	2	4	5	787	2	44	49	72	5	...	...	8,602	204	732	264	
Eastern Bengal and Assam.	880·9	237	...	7	7	182	16	5	...	66	...	...	...	4,329	105	82	31	
Bengal	2,011·1	901	17	58	110	49	1	...	1	118	...	1	...	34,805	1,491	1,310	966	
United Provinces	6,359·0	1,341	89	98	208	100	6	1	...	31	...	...	...	18,063	448	570	619	
Punjab	710·2	58	...	4	11	...	...	...	...	48	...	41	2	15,066	851	545	311	
Madras	781·1	137	...	25	38	1	...	...	...	...	...	...	...	...	...	...	...	
State Railways	...	....	...	...	...	109	1	1	...	...	...	...	...	3,262	200	164	164	
TOTAL	17,732·3	3,125	82	279	597	1,245	26	51	50	355	5	42	2	85,303	3,107	3,407	2,364	

No.

STATEMENT of OFFENCES

	Counterfeit Coins, Sections 231 and 232, Indian Penal Code.			Making, buying and selling instruments for counterfeiting Coins, Sections 233 and 234, Indian Penal Code.			Possessing instruments or materials for counterfeiting Coins, Section 235, Indian Penal Code.			Abetting in India the counterfeiting of Coins, Section 236, Indian Penal Code.			Importing or Exporting Counterfeited Coins, Sections 237 and 238, Indian Penal Code.		
	1			2			3			4			5		
	Number of cases brought to trial.	Number of persons tried.	Number of persons convicted.	Number of cases brought to trial.	Number of persons tried.	Number of persons convicted.	Number of cases brought to trial.	Number of persons tried.	Number of persons convicted.	Number of cases brought to trial.	Number of persons tried.	Number of persons convicted.	Number of cases brought to trial.	Number of persons tried.	Number of persons convicted.
1. Madras	2	6	...	...	...	...	1	2	...	...	...	...	...	...	...
2. Bombay	2	6	6	1	4	4	3	7	7	...	...	...	1	4	4
3. Bengal	1	1	1	...	...	...	...	...	...	...	...	...	1	2	...
4. Eastern Bengal and Assam	7	15	8	1	7	3	13	24	9	...	...	...	...	...	...
5. United Provinces of Agra and Oudh including Kumaon (Tehri State) and Rampur.	18	30	27	...	...	...	5	10	5	...	...	...	...	...	...
6. Punjab	5	7	5	...	...	...	5	13	5	...	...	...	...	...	...
7. Burma	10	16	10	3	4	2	11	17	11	...	...	...	...	...	...
8. Central Provinces and Berar	...	...	...	...	...	...	1	1	...	...	...	...	...	...	...
9. North-West Frontier, Peshawar.	2	3	3	...	...	...	1	1	...	...	...	...	5	5	1
10. Ajmer-Merwara	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11. Baluchistan	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12. Coorg	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13. Central India	2	2	1	...	...	...	...	...	...	...	...	...	...	...	...
14. Rajputana and its Agency	...	...	...	...	...	...	1	3	...	...	...	...	...	...	...
15. Hyderabad	9	12	12	2	2	1	...	...	...	...	...	...	...	...	...
16. Mysore	3	5	5	...	...	...	...	...	...	...	...	...	...	...	...
17. Kashmir	4	4	...	...	...	...	...	...	...	...	...	...	...	...	...
18. Baroda	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
TOTAL	65	107	78	7	17	10	41	78	37	...	...	...	7	11	5

V.

against COINAGE for 1911.

POSSESSING AND DELIVERING COUNTERFEITED COINS, SECTIONS 239, 240, 241, 242 AND 243, INDIAN PENAL CODE.			CAUSING COINS TO BE OF DIFFERENT WEIGHT OR COMPOSITION FROM THAT FIXED BY LAW, SECTIONS 224, 246 AND 247, INDIAN PENAL CODE.			TAKING COINING INSTRUMENTS FROM A MINT, SECTION 245, INDIAN PENAL CODE.			FRAUDULENTLY ALTERING APPEARANCE OF ANY COINS, SECTIONS 248 AND 249, INDIAN PENAL CODE.			POSSESSING AND DELIVERING ALTERED COINS, SECTIONS 250, 251, 252, 253 AND 254, INDIAN PENAL CODE.			TOTAL.		
6			7			8			9			10			11		
Number of cases brought to trial.	Number of persons tried.	Number of persons convicted.	Number of cases brought to trial.	Number of persons tried.	Number of persons convicted.	Number of cases brought to trial.	Number of persons tried.	Number of persons convicted.	Number of cases brought to trial.	Number of persons tried.	Number of persons convicted.	Number of cases brought to trial.	Number of persons tried.	Number of persons convicted.	Number of cases brought to trial.	Number of persons tried.	Number of persons convicted.
32	38	23	...	...	...	...	...	...	5	5	2	6	7	2	46	58	27
18	24	13	...	...	...	...	...	...	...	...	...	3	3	2	28	48	36
23	26	17	...	...	...	...	...	...	...	...	...	4	4	4	29	33	22
43	55	32	...	...	...	...	...	...	...	...	...	3	4	2	67	105	54
62	72	53	...	...	...	...	...	...	2	2	2	3	3	3	90	117	90
47	57	22	...	...	...	...	...	...	4	4	1	3	3	2	64	84	35
57	75	31	...	...	...	...	...	...	1	1	...	1	2	2	83	115	56
10	10	6	...	...	...	...	...	...	3	3	3	3	5	2	17	19	11
6	10	1	...	...	...	...	...	...	...	...	...	3	3	...	17	22	5
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	1	1	1	1	1	1
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	9	3	...	...	...	...	...	...	...	...	...	1	1	1	17	12	5
10	9	5	...	...	...	...	...	...	5	11	11	5	8	7	21	31	23
10	12	4	...	...	...	...	...	...	...	...	...	...	...	...	21	26	17
4	5	2	...	...	...	...	...	...	...	...	...	1	1	1	8	11	8
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	4	4	...
5	5	1	...	...	...	...	...	...	...	...	...	...	...	...	5	5	1
341	407	213	...	...	...	...	...	...	20	26	19	37	45	29	518	691	391
														TOTAL OF 1910	564	714	431

REPORT ON THE WORKING OF HIS MAJESTY'S ASSAY OFFICE, CALCUTTA.

No. 46, dated Calcutta, the 1st June 1912.

From—Major J. J. BOURKE, I.M.S., Assay Master, Calcutta,

To—The Secretary to the Government of India, Finance Department.

I have the honour to submit the following report on the working of the Assay Department, Calcutta, for the official year 1911-12.

2. The appended statement gives the number of assays made during the year :—

DESCRIPTION.	1911-12.		1910-11.	
	Number.	Total.	Number.	Total.
GOLD.				
Assays on gold from all sources	471		123	
Check assays	208		64	
		679		187
SILVER.				
Assays on silver alligated for standard coinage—				
for rupees 2,118 / „ ½-rupees 300 / „ ¼-rupees 378 / „ ⅛-rupees 684	3,480		5,056	
Do. pyx coins	4,389		6,927	
Do. miscellaneous	3,235		679	
Check assays	826		826	
		11,930		13,488
BRONZE.				
Assays on bronze meltings for coinage	35		224	
Do. pyx coins	24		333	
Do. miscellaneous	*Nil*		24	
		59		581
MISCELLANEOUS.				
Parting assays	70		114	
Assays on various metals and ores	1,420		1,060	
Assays on Mint drosses	42		36	
		1,532		1,210
TOTAL FOR THE YEAR		14,200	...	15,466

3. *Gold assays.*—The total number of gold assays from all sources during the year amounted to 471, of which 84 were done for the Mint.

4. Average fineness per mille of silver meltings for coinage :—

	Rupees.	½-rupees.	¼-rupees.	⅛-rupees.
Average for the year 1911-12 .	916·134	916·053	915·815	915·650
Average for the year 1910-11 .	915·979	915·936	915·836	915·677

5. *Gold in silver coinage.*—The average proportion of gold found by monthly parting assays in the silver pyx coins was :—

for rupees 0·543 per mille.
„ ½-rupees 0·506 „
„ ¼-rupees 0·541 „
„ ⅛-rupees 0·553 „

The coinage of the year was computed to contain 3,136 Troy ounces of gold, in value about £13,297.

6. *Pyx trials of silver coins.*—The following tables give the details of the pyx trials of silver coins for weight and fineness :—

Trials for weight.

Description of coins.	Number of trials.	Total number of coins weighed.	Average weight in grains.	Number of coins above the legal remedy for weight.	Number of coins below the legal remedy for weight.
Rupees	156	1,560	180·049	1	*Nil*
Half-rupees	51	510	90·008	*Nil*	*Nil*
Quarter-rupees	48	480	45·018	2	*Nil*
One-eighth-rupees	78	780	22·519	12	4

Trials for fineness.

Description of coins.	Number of trials.	Total number of coins assayed.		Average fineness per mille of coins assayed.		Number of coins above the legal remedy for fineness.	Number of coins below the legal remedy for fineness.
		Singly.	In groups after melting.	Singly.	In groups after melting.		
Rupees . . .	155	1,550	3,100	916·442	916·616	*Nil*	*Nil*
Half-rupees . . .	51	510	2,050	916·327	916·594	*Nil*	*Nil*
Quarter-rupees . .	48	480	4,800	916·381	916·574	*Nil*	*Nil*
One-eighth-rupees . .	80	800	15,600	916·449	916·624	*Nil*	1

7. The number of assays of standard meltings for bronze coinage, and of bronze pyx coins, diminished in comparison with the preceding year owing

to the introduction of a system of taking the pyxes from the output of each month instead of resorting to weekly pyxes as heretofore.

Description.	Copper per cent.	Tin per cent.	Zinc per cent.
Average fineness of bronze meltings for 1911-12	94·767	4·100	1·060
Ditto ditto 1910-11	94·913	4·016	1·030
Average fineness of bronze pyx coins for 1911-12	94·610	4·096	1·112
Ditto ditto 1910-11	94·923	4·010	1·029

8. *Miscellaneous assays.*—Of the 1,420 assays under the head "Assays on various metals and ores," 1,003 assays were made for the Mint, for various Police Officers and Magistrates, on coins either counterfeit or suspected to be counterfeit, or on suspected materials for manufacturing counterfeit coins.

9. *Verification of weight-pieces.*—The following verifications were made during the year:—

1. Assay Office Working Standard Avoirdupois set.
2. Assay Office Kilogramme set.
3. Assay Office Laboratory Tola set and fractions.
4. Assay Office Working Standard Tola set and fractions.
5. Mint Working Standard Tola set.

10. The post of Assay Master was held by Lieutenant-Colonel J. Lloyd Jones, I.M.S., from the beginning of the year under report up to 19th July 1911, by Lieutenant-Colonel F. C. Hughes, I.A., on the 20th and 21st July 1911 in addition to his own duties of Deputy Assay Master, and by Major J. J. Bourke, I.M.S., from 22nd July till the end of the year.

Lieutenant-Colonel Hughes carried out the duties of Deputy Assay Master from 1st April to 26th September 1911 and from 23rd October 1911 to 13th March 1912. He was on leave for the remaining portion of the year, during which time Major Bourke, in addition to his own, performed the duties of Deputy Assay Master.

REPORT ON THE WORKING OF THE BOMBAY MINT.

No. 768, dated Bombay, the 13th June 1912.

From—Major A. L. C. McCormick, R.E., Mint Master,

To—The Secretary to the Government of India, Finance Department, Simla.

I have the honour to submit the Annual Report on the operations of the Bombay Mint for the financial year 1911-1912, together with the prescribed statements.

GOLD.

2. *Receipts.*—(*a*) The value of sovereigns and half-sovereigns tendered during the year amounted to Rs. 21,17,69,860 and was in excess of the previous year by Rs. 10,22,40,733. They were classified as follows :—

Classification.	Value in rupees.
Sovereigns of current weight	20,40,29,250
Sovereigns of short weight or not more than three grains less than the standard weight (nominal value)	76,98,375
Half-sovereigns of short weight or not more than three grains less than the standard weight (nominal value)	41,820
Sovereigns of reduced weight or more than three grains less than the standard weight (bullion value)	245
Half-sovereigns of reduced weight or more than three grains less than the standard weight (bullion value)	170
Total	21,17,69,860

(*b*) In addition to the above, 6,100 sovereigns tendered as current weight were found to be reduced, soldered, fraudulently defaced, counterfeit or of foreign mintage, on detailed examination at the Mint, and were withdrawn by the tenderers.

(*c*) With the exception of gold of the value of Rs. 415 used for medal work, the whole of the gold received, together with the balance of the previous year, was transferred to the Currency Gold Coin Account.

(*d*) No remittances were shipped by the Mint to London during the year.

(*e*) At the close of the year the balance of the Currency Gold Coin Account amounted to Rs. 6,62,83,500 and of the Gold Bullion Account to Rs. 314. These balances consisted of sovereigns and half-sovereigns.

SILVER.

3. *Receipts.*—The silver receipts comprised—(*a*) Withdrawn and uncurrent silver coins received for re-coinage of the nominal value of Rs. 98,54,273 classified as follows :—

Classification.	Value in rupees.
Government rupees and half-rupees of 1835	3,04,680
Ditto ditto 1840 (1st issue)	7,99,358
Ditto ditto 1840 (2nd issue)	34,09,403
Government (shroff-marked, defective and dumb coins)	10,33,050
Ditto worn coins	29,17,772
Ditto reduced coins	16,309
Ditto rupees of George V (1911)	13,56,800
Fraudulently defaced coins from Railways	4,218
Arcot coins	12,625
Confiscated coin	63
Total	98,54,273

(*b*) Tenders of silver bullion from the Exchange Banks for coinage into British dollars amounting to 79,882,990 tolas fine. Of this amount silver of the outturn value of Rs. 8,79,95,472 was brought to account during the year.

(*c*) Consignments of new dumb subsidiary silver coin of the Straits Government returned for re-mintage, consisting of 640,000 five cents, 60,000 ten cents and 20,000 twenty cents. The amounts brought to account during the year were 800,000 five cent pieces, 100,000 ten cent pieces and 40,000 twenty cent pieces of the outturn value of Rs. 88,372.

The description and weight of the silver tendered for coinage into British dollars and for subsidiary coins for the Straits Government is given below:—

Description of silver tendered.	Amount in lakhs of tolas.
Bar silver	797·36
Sycee silver	1·46
Old cent pieces and Straits dollars	0·01
New 20 do.	0·09
„ 10 do.	0·14
„ 5 do.	0·75
Total	799·81

(*d*) No silver was received for rupee coinage from the Secretary of State during the year.

4. *Silver Coinage.*—(*a*) The Government coinage for the year which consisted of rupees, half, quarter and eighth rupees, amounted to 15,897,391 pieces, valued at Rs. 1,25,74,209, and was wholly on Government account.

(*b*) 37,599,245 British dollars were issued to Exchange Banks for export during the year, all the coins having been shipped to Hongkong—the amount manufactured being 37,470,509, which is the highest on record since the commencement of the dollar coinage.

(*c*) 96,797 ten cent pieces and 564,668 five cent pieces were manufactured for the Straits Government, the amount of coins shipped to Singapore being 40,000 twenty cents, 100,000 ten cents and 719,950 five cents.

(*d*) The whole of the coinage was found by the Assay Master to be within legal remedy for weight and fineness.

Silver Branch of the Gold Standard Reserve.—One crore of rupees was withdrawn from the Gold Standard Reserve during the year, leaving a balance of one crore at the end of the year.

5. *Meltings.*—Uncurrent Government silver coin, as well as new subsidiary coins from the Straits Government, were taken into direct alligation. Bar silver tendered for dollar coinage was also similarly treated from 1st September 1911, Government sanction for which was accorded—*vide* Finance Department letter No. 6132-F., dated 7th October 1911.

This treatment of the bar silver tendered for dollar coinage proved very satisfactory as the Banks were enabled to receive payment in dollars for the silver bars tendered by them in less time than had been the case previously, and at the same time economies were effected in the Melting Department of the Mint.

During the year a set of experimental double moulds for dollar meltings were constructed and brought into use with good results, and it is hoped that next year their use will become general, in which case it will be possible, whilst employing the present mould carriages, to melt for dollars in pots of 21,000 tolas capacity in place of the present 15,000 tolas pots which are somewhat small. This will bring about further small economies in the Melting Department and reduce the work of the calculating staff in the Mint Office.

To lighten this work which, at times is very heavy, the sanction of the Government of India has been obtained to evolve and print sets of alligation tables for use in the office.

6. *Percentages of Good Coin.*—The percentages of good coin calculated on the amounts laminated were as detailed below :—

Description of coins.	Weight of ingots laminated.	Percentage of good coin.
	Tolas.	
Government rupees	16,857,353	69·34
Do. half-rupees	673,840	64·26
Do. quarter rupees	456,585	64·14
Do. eighth rupees	406,733	57·82
British dollars	136,372,255	63·95
Ten cents	55,269	41·45
Five cents	130,941	45·81

7. *Silver Operative Losses.*—The silver operative losses for the year 1911-1912, as detailed below, amounted to Rs. 87,499-15-2, all silver being valued at the uniform rate of rupee one per standard tola.

	R	a.	p.		R	a.	p.
Opening balance .	39,87,545	11	7	Issues . . .	9,80,67,983	14	2
Receipts . . .	9,78,89,364	11	0	Closing balance . .	37,21,426	9	3
				Operative loss for the year	87,499	15	2
	10,18,76,910	6	7		10,18,76,910	6	7

This gives a rate of loss of Rs. 88·20 per lakh of tolas coined.

The above has been calculated as far as practicable on the principles laid down under the revised system of accounting for operative losses and gains sanctioned by Government, *vide* Comptroller General's letter No. B.R.C.-422-134-11, dated the 28th March 1912. Next year the operative losses for Government, Dollar and Colonial coinages will be shown separately.

NICKEL.

8. The number of nickel one-anna pieces coined during the year was 41,760,000 of the value of Rs. 26,10,000, being more by Rs. 97,500 than that of the previous year. This value includes an initial coinage of the new design (George V) of the value of Rs. 1,47,500 which was subsequently rejected and remelted on the orders of the Government of India as the design was finally not approved.

During the year some improvements were effected in the manufacture of the nickel pieces with the waved edge. Partly on account of these improvements but mainly owing to the care and attention bestowed in the Nickel Cutting Department by the Engineer Superintendent Mr. Baker, the nickel coins issued were of a better finish and more uniform in shape than in former years.

Experiments were also commenced in the Mint on the blanching of nickel blanks to still further improve the colour of the coin on issue to the public, and when the machines now employed are in proper working order it is hoped that these experiments will prove successful.

Attempts are being made to adapt the 17 screw presses, only used at present for silver coinages, for nickel annas, and it is expected that these attempts under the direction of Mr. Race will also be brought to a successful conclusion early next year, in which case, provided no large silver coinage is in progress, the capacity of the Coining Department of this Mint to coin nickel pieces will be about doubled.

The total operative losses written off the books during the year amounted to 29 maunds, giving a percentage of ·406 per 100 maunds of metal rolled.

BRONZE.

9. No bronze coinage was carried out during the year.

MISCELLANEOUS.

10. *Miscellaneous work.*—(*a*) This consisted of the recurring supply of dies, medals, etc., to various public institutions, the manufacture and adjustment of scales and weights and miscellaneous supplies and repairs undertaken for Government Departments and the public, the profit made being Rs. 547.

(*b*) There were 157 war medals, 185 clasps and 1 star issued during the year.

(*c*) During the year the Mint was called upon to strike medallions which the Government of India had decided should be distributed to school children on the occasion of the visit to India of Their Imperial Majesties the King-Emperor and Queen-Empress. The medallions were of cupro-nickel, each 1·25 inch in diameter and bore on the obverse the effigies of Their Majesties, with names, and on the reverse the date with a crown and conventional scrolls, etc. A short length of ribbon of garter blue fastened by a pin was attached by two small rings on the rim of each medal.

The obverse and reverse of the medallion were designed by Mr. F. K. Wezel of the Calcutta Mint, the design on the obverse having been adopted with modifications from that of the English Coronation medal.

The number of fitted medals despatched from the Mint to the various states and provincial distributing centres and private educational institutions was 3,259,952.

11. *Treasure Trove Coins.*—During the year 164 coins of the various Mogul Emperors and other designs, which were undecipherable, were forwarded to the Mint by the Bombay branch, of the Royal Asiatic Society, for disposal to numismatists. The amount realised by the sales of Treasure Trove coins during the year was Rs. 196, the metal value at which the coins were credited in the Mint accounts being Rs. 103. After defraying postage and other charges, the profit on the sale of these coins amounted to Rs. 92.

12. *Mint Working Standards.*—The weights in all the Departments were periodically compared with the standards and any difference found carefully adjusted.

ANALYSIS OF REVENUE AND EXPENDITURE.

13. *Revenue—*

(*a*) *Charges levied. Mint Seigniorage.*—The seigniorage on silver tendered for British dollar coinage and for which outturn certificates were issued during the year, amounted to Rs. 17,59,307, the premelting fees at Rs. 48½ per lakh on silver taken in direct alligation (*vide* para. 5 above) amounted to Rs. 30,154, and the seigniorage recovered from the Straits Government for subsidiary coinage to Rs. 3,197.

(*b*) *Gain on coinage operations.*—The gain on this head was Rs. 62,242, being more than that of the preceding year by Rs. 36,745.

(*c*) *Cash and transfer receipts.*—These receipts amounted to Rs. 2,73,819 and were more by Rs.2,60,579 as compared with the year 1910-1911, and were chiefly due to the large issue of school children's medallions.

(*d*) *Pro formâ receipts.*—A *pro formâ* credit at 5 per cent. on the value of nickel coins turned out during the year amounted to Rs. 1,30,500 being more by Rs. 4,875 than that of the previous year.

14. *Expenditure.*—

(*a*) *Loss on Coinage.*—*Silver.*—The difference between the par and weight values of uncurrent coin received from Government Treasuries for re-coinage amounted to Rs. 1,62,225 as against Rs. 1,59,765 in the preceding year.

(*b*) *Salaries and Establishment.*—The total expenditure on salaries and establishment for the year as compared with that of the preceding 12 months is shown in the margin. The increase in extra establishment and overtime pay is due to the heavy dollar coinage and school children's medallion work.

	1911-12.	1910-11.
	R	R
Fixed establishment . .	2,20,275	2,19,370
Extra establishment and overtime pay . . .	1,70,005	96,361
TOTAL .	3,90,280	3,15,731

(*c*) *Copper used for alloy and for contingent purposes.*—The amount expended under this head was Rs. 92,616 as against Rs. 18,339 for 1910-1911.

(*d*) *Local and English stores.*—The expenditure under these heads amounted to Rs. 2,27,921 as compared with Rs. 94,704 in the preceding year, the increase being due to reasons stated in para. 14 (*b*) above.

(*e*) *Contingent Charges.*—These charges amounted to Rs. 40,012 and showed an increase of Rs. 15,260 on last year's figures.

(*f*) *Transfer Charges.*—These amounted to Rs. 15,627 as against Rs. 932 in the preceding 12 months.

15. *Resumé of Revenue and Expenditure.*—The result of the transactions of the year, as summarised in Statement No. I, shows that, including interest on capital outlay, the net profit from Mint Operations during the year was Rs. 8,68,600.

16. *Balances sunk in the Mint.*—The balances of silver bullion belonging to Government, valued at rupee one per tola of standard fineness, stood at the beginning of the year at Rs. 18,65,376 and at its close at Rs. 7,00,200. The average daily balance, exclusive of silver belonging to tenderers, was Rs. 34,30,490. The minimum daily balance was Rs. 6,99,359 on the 29th March 1912 and the maximum was Rs. 68,46,928 on the 14th November 1911.

17. *Capital Account.*—Rs. 20,648 on account of buildings and Rs. 8,433 on account of machinery were added to their respective heads during the year. The balance at debit of this account at the end of the year after allowing for depreciation on buildings and plant stood at Rs. 38,10,507.

18. *Extensions.*—During the year under review the Public Works Department constructed a Dross Grinding room costing Rs. 13,132 and completed the construction of a new chimney at a further sum of Rs. 3,237.

OFFENCES AGAINST THE COINAGE.

19. *Return of Counterfeit Coins.*—The usual return of counterfeit coins is appended to this report.

2,198 counterfeit coins (1,923 rupees, 81 half-rupees, 48 quarters and 146 one-eighths) were received for examination during the year as against 1,643 in 1910-1911, and were classified as follows :—

(i) 1,094 coins (40 castings and 1,054 struck) received from the Bombay, Baroda and Central India and Rajputana-Malwa Railways, and 44 struck counterfeits received from the Bank of Bombay, Ahmedabad, in four lots were accepted as exceptionally well executed.

(ii) 118 coins (64 castings and 54 struck) were sufficiently good to deceive the public as regards colour and finish.

(iii) The remaining 942 (786 castings and 156 struck) were in the majority of cases inferior specimens of low touch silver or base metal and noticeably false.

(The second and third classes above include coins which were returned to the Railways, as they did not come up to the standard of excellence required by Government.)

2,003 counterfeit coins (1,344 rupees, 37 half-rupees, 206 quarters and 416 one-eighths) were discovered in remittances of uncurrent coins to the Mint as against 2,618 in the previous year.

During the year under report 42,760 counterfeit coins were cut at Treasuries and Railways as against 39,324 in 1910-1911.

247 one-anna pieces received during the year were found to be in the majority of cases of base and inferior metal.

I.

Account of the Total Revenue and Expenditure of the Bombay Mint during the year 1911-1912.

Approved of in Comptroller General's Letter No. 2012, dated 12th September 1908.

REVENUE.	₹ a. p.	₹ a. p.	EXPENDITURE.	₹ a. p.	₹ a. p.
To Charges levied—			By Working Expenses—		
Silver—			*Loss on Coinage Operations*—		
Percentage on new rupee coinage	...		*Silver*—		
Seigniorage on dollar coinage	17,59,307 0 0		Operative losses	87,499 15 2	
Seigniorage on subsidiary coinage for the Straits Government	8,196 8 10		Loss by over standard weight and fineness of new coins issued	775 14 0	
Premelting fees	30,200 8 0		Loss on withdrawals of uncurrent silver coins	1,62,225 5 0	
Assay and melting fees (Private)	136 13 0		Other items	883 0 0	
			Loss by under standard value of uncurrent silver coins withdrawn from circulation	...	
					2,51,384 2 2
Gold—					
On bullion from Government Departments	...				
		17,92,840 13 10			
			Miscellaneous Charges—		
			Loss on melting gold	3 4 7	
			Other items	62,259 0 9	
					62,262 5 4
To Gain on Coinage Operations—			By Salaries and Establishment—		
Silver—			Fixed Establishment	2,20,275 8 2	
Gain by under standard weight and fineness of new coin issued	...		Extra Establishment	1,34,729 11 0	
Gain by Assay Benefit	42,796 0 6		Overtime pay	35,275 3 0	
Gain by over standard value of uncurrent silver coins withdrawn from circulation	7,432 0 0				3,90,280 6 2
Other items	11,880 12 4		By Copper, Bronze and Nickel—		
				₹	
			Used for alloy	92,320-13-9	
			Used for contingent purpose	416-15-2	
				92,737-12-11	
			Less—		
			Returned from troughs	121-12-5	
				92,616 0 6	
			Miscellaneous charges	...	
					92,616 0 6
Gold—					
Miscellaneous	138 7 6		By Local Stores purchased—		
		62,242 3 10			
			Coal, coke, charcoal and firewood	58,241 2 7	
			Oil, grease and tallow	6,704 9 2	
			Acids	147 0 0	
			Iron and brassmongery and hardware	1,163 0 0	
			Metals	1,406 11 10	
			Wood for boxes	104 13 5	
			Bullion trucks, moulds, etc.	2,890 1 10	
To Cash Receipts—			Miscellaneous	62,546 10 3	
					1,33,204 1 1
For scales, weights and other articles supplied and work done for private individuals	9,390 9 0		By Contingent Charges—		
			Books	313 11 6	
			Scales and weights	690 0 0	
			Cart, coolie, and boat-hire	397 8 0	
Carried over	9,390 9 0	18,55,083 1 8	Carried over	1,401 3 6	9,29,746 15 3

Account of the Total Revenue and Expenditure of the Bombay Mint during the year 1911-1912—*contd.*

	R a. p.	R a. p.		R a. p.	R a. p.
Brought forward .	9,390 9 0	18,55,083 1 8	Brought forward .	1,401 3 6	9,29,746 15 3
To Cash Receipts—*contd.*			**By Contingent Charges—*contd.***		
For old stores and materials . .	2,761 13 9		Postage and telegrams .	701 2 6	
Miscellaneous . .	358 14 4		Water-supply . .	2,867 10 6	
		12,511 5 1	Inspection of Boilers .	335 0 0	
			Rents, Rates and Taxes .	13,999 9 7	
			Charges for Electricity and Gas . .	4,415 0 1	
			Freight on Europe stores	135 1 0	
To Transfer Receipts—			Travelling allowances .	560 14 0	
			Plague and other allowances . . .	205 0 0	
For scales, weights and other articles supplied and work done at the Mint for Government Departments . .	2,60,941 7 9		Furniture . . .	332 4 0	
			Miscellaneous . .	15,159 8 5	
					40,012 5 7
			By Transfer Charges—		
			Coin bags . .	9,940 0 0	
			Landing and shipping charges . .	347 2 7	
			Articles supplied by other departments . .	5,340 0 6	
					15,627 3 1
For war medals for Military Department .	75 11 10		By English stores used from stock—		
		2,61,017 3 7	Value of stores used .	94,852 4 10	
			Less—		
			One-fifth freight charges above . . .	135 1 0	
					94,717 3 10
For telegram, packing, shipping and landing charges on account of the Straits Government . . .	...		By Public Works Charges—		
			Repairs and alterations to buildings . .	...	
		290 12 6			6,989 2 1
			By Miscellaneous Charges External to Mint—		
			Stationery . . .	1,253 11 7	
			Printing . .	769 6 4	
					2,023 1 11
To *pro formâ* Receipts—			By Cost of Pensions and Furlough Allowances—		
			One-sixth of the salaries of superior servants .	31,752 0 0	
*Five per cent. on value of nickel coins manufactured . . R26,10,000	...		One-sixteenth of the salaries of inferior servants .	751 8 0	
					32,503 8 0
		1,30,500 0 0	Interest at 3½ % on Mint land, buildings and plant value . . .	38,10,507 0 0	
			At average silver balance .	34,30,490 0 0	
			„ „ Nickel „ .	2,64,821 0 0	
			„ „ Bronze „ .	59,607 0 0	
			Balance of Europe stores .	1,25,508 0 0	
				76,90,933 0 0	2,69,183 0 0
			By Balance .		8,68,599 15 1
Total .	...	22,59,402 6 10	Total .	...	22,59,402 6 10

* This represents an approximate credit to cover working expenses for nickel coinage.

Abstract of the Capital Account of the Mint to end of March 1912.

	Land.	Buildings.	Plant.	Total.		Land.	Buildings.	Plant.	Total.
	R a. p.	R a. p.	R a. p.	R a. p.		R a. p.	R a. p.	R a. p.	R a. p.
Total expenditure on Capital Account brought forward from last year .	12,62,200 0 0	17,14,090 0 0	9,02,023 0 0	38,78,313 0 0	(Depreciation at 5% on plant and 3% on buildings) .	...	51,411 0 0	45,101 0 0	96,512 0 0
Expenditure during current year .	...	4,279 0 0	8,433 0 0	12,712 0 0	Value of articles lost or destroyed . .	...	375 0 0	...	375 0 0
By Civil Department . .	...	...	...	...					
By P. W. Department	...	16,369 0 0	...	16,369 0 0					
Other items .	...	...	...	...	Balance at debit . .	12,62,200 0 0	16,82,952 0 0	8,65,355 0 0	38,10,507 0 0
Total .	12,62,200 0 0	17,34,738 0 0	9,10,456 0 0	39,07,394 0 0	Total .	12,62,200 0 0	17,34,738 0 0	9,10,456 0 0	39,07,394 0 0

II.

STATEMENT of the COINAGE of the BOMBAY MINT for the year 1911-1912.

	Tale of Pieces.	Nominal Value.	Total. Tale.	Total. Value.	Remarks.
Silver—		*R* a. p.		*R* a. p.	
Rupees	11,681,687	1,16,81,687 0 0			
Half-Rupees	585,430	2,92,715 0 0			
Quarter-Rupees	1,168,182	2,92,045 8 0			
Eighth-Rupees	2,462,092	3,07,761 8 0			
British Dollars	37,470,509	*8,50,23,954 0 0			
Ten Cents	96,797	†14,749 0 0			
Five Cents	564,668	†43,016 0 0			
			54,029,365	9,76,55,928 0 0	
Nickel—					
One-anna	41,760,000	26,10,000 0 0			
Bronze	*Nil*	*Nil*	41,760,000	‡26,10,000 0 0	
GRAND TOTAL	....	.....	95,789,365	10,02,65,928 0 0	

* This figure represents the outturn value of the dollars in standard tolas.
† Do. do. cents. do.
‡ Includes nickel coin (new design) of the value of Rs. 1,47,500 rejected and subsequently melted up.

III.

STATEMENT showing the COST of MISCELLANEOUS WORK done in the BOMBAY MINT during the year 1911-1912.

Description.	Amount.	Total.	Remarks.
Receipt.	*R* a. p.	*R* a. p.	
Receipt for Medals, Seals, Stamps, etc.	2,64,924 9 9		
Adjusting Weights	2,554 9 0		
Sale-proceeds of Treasure Trove coins	195 10 0		
Miscellaneous	2,657 4 0		
		2,70,332 0 9	
Expenditure.			
Engraver's Labour	272 3 4		
Workshop do.	22,701 13 8		
Jeweller's do.	29 2 0		
Stores used (including gold, silver, nickel and copper)	1,23,240 9 6	1,46,243 12 6	
NET PROFIT RUPEES	...	1,24,088 4 3	Including R91-14-0, profit on sale of Treasure Trove gold and silver coins. Including R1,23,448-12-10, profit on Coronation medals.

IV.

STATEMENT OF COUNTERFEIT COINS received at the BOMBAY MINT, showing also those cut and broken at the TREASURIES, compiled from the QUARTERLY RETURNS furnished by TREASURY OFFICERS during 1911-1912.

NAME OF PROVINCE.	Nominal value of remittances of uncurrent coins received at the Mint in thousands of rupees.	COUNTERFEITS RECEIVED AT THE MINT.												Counterfeit coins cut at the several Indian Treasuries as per Quarterly Returns furnished by the Treasury Officers and Railway Administrations under Article 591, Civil Account Code, and Government Resolution No. A.-6192, dated 10th December 1901.				REMARKS.
		In remittances of uncurrent coins from Treasuries.				From Treasury and other officers under Article 581, Civil Account Code, and Government Resolution No. 1004-A., dated 21st February 1901.				Received at the Mint for examination.								
		R	½-R	¼-R	⅛-R	R	½-R	¼-R	⅛-R	R	½-R	¼-R	⅛-R	R	½-R	¼-R	⅛-R	
Bombay	8,361	507*	7	69	105	1,037	57	6	2	396	8	7	6	16,674	577	631	922	*Includes 61 counterfeit rupees found in remittances of R7,84,007 received for special examination.
India	7	3	...	1	2	...	...	...	...	...	...	...	...	...	...	...	...	
Quetta (Baluchistan)	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	
Madras	2,102	226	4	77	91	74	1	4	56	58	...	18	54	14,769	1,886	1,117	1,298	
Punjab	4,159	468	3	55	211	...	...	...	...	17	...	1	...	283	...	...	...	
United Provinces of Agra and Oudh	...	...	...	...	...	8	...	...	...	2	1	...	...	171	4	2	3	
Central Provinces	279	52	...	2	2	15	...	...	...	32	...	...	...	1,628	29	17	7	
Hyderabad (Deccan)	...	...	...	...	...	...	...	...	...	...	...	...	...	75	5	1	3	
Rajputana	674	81	23	...	...	109	...	...	...	113	14	12	28	1,827	55	34	25	
Central India	81	3	...	...	2	41	...	...	...	20	...	...	...	1,170	17	17	13	
Burma	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
North-West Frontier Province	13	9	...	2	3	...	...	...	...	...	...	...	...	...	...	...	...	
TOTAL	10,626	1,344	87	206	416	1,284	58	10	58	639	23	38	88	36,597	2,073	1,819	2,271	

REPORT ON THE WORKING OF HIS MAJESTY'S ASSAY OFFICE, BOMBAY.

No. 91, dated Bombay, the 13th June 1912.

From—Captain H. B. DRAKE, I.M.S., Officiating Assay Master, Bombay,

To—The Secretary to the Government of India, Finance Department, Simla.

I have the honour to submit the following report on the operations of the Assay Department, Bombay, for the official year 1911-1912.

2. *Number and description of Assays.*—The number of assays during the year amounted to 34,509 as against 13,809 in the previous financial year.

The details are shown in the following table :—

Description.	Number.	Total.
GOLD.		
Assays on gold from all sources	326	
Check assays on fine gold	46	372
SILVER.		
Assays on silver received for coinage	2,830	
Do. alligated for silver standard coinage	22,494	
Do. pyx coins	5,086	
Do. miscellaneous	2,004	
Check assays on fine silver	1,116	33,530
MISCELLANEOUS.		
Parting assays	54	
Assays on various metals and ores	343	
Assays on Mint Drosses	210	607
TOTAL FOR THE YEAR		34,509

3. *Gold and Silver Assays.*—The total number of gold assays from all sources during the year was 372 as against 1,010 in the previous year; of these 24 assays were done for the Mint.

The total number of silver assays from all sources was 33,530 as against 12,362 in the previous year; of these 32,360 were done for the Mint.

4. *Meltings for Silver Standard Coinage.*—Silver meltings for rupees were assayed during the months of April 1911 and July to March 1912, for half rupees May 1911 and January 1912, for quarter rupees May 1911 only, for one-eighth rupees May, June 1911 and January 1912, for British dollars during the whole year, for 10 cents December 1911 only, and 5 cents June and December 1911.

The average fineness of the silver meltings was :—

For rupees	915·938	per mille.
For ½ rupees	915·751	„
For ¼ rupees	915·686	„
For ⅛ rupees	915·553	„
For British dollars	898·959	„
For ten cents	596·367	„
For five cents	594·600	„

as shown in the following table :—

Months.	Rupees.	½ rupees.	¼ rupees.	⅛ rupees.	British dollars.	Ten cents.	Five cents.
April 1911	915·969	...	...	...	898·940	...	...
May „	...	915·900	915·686	915·390	898·976	...	...
June „	...	...	...	915·779	898·966	...	594·933
July „	915·900	...	...	...	898·967	...	...
August „	915·940	...	...	...	898·969	...	...
September „	915·977	...	...	...	898·890	...	...
October „	915·700	...	...	...	898·906	...	...
November „	915·902	...	...	...	899·089	...	...
December „	915·776	...	...	...	898·826	596·367	594·000
January 1912	915·912	915·453	...	915·500	898·864	...	...
February „	915·975	...	...	...	898·998	...	...
March „	915·983	...	...	...	899·049	...	...
AVERAGE FOR THE YEAR.	915·938	915·751	915·686	915·553	898·959	596·367	594·600

5. *Gold in Silver Coinage.*—The average proportion of gold found by monthly " Parting Assays " in the silver pyx coins for the year was ·218 per mille for rupees, ·022 for ½ rupees, ·030 for ¼ rupees, ·149 for ⅛ rupees, ·041 for British Dollars, ·035 for 10 cents, and ·078 for 5 cents.

6. *Pyx trials Rupees.*—The trials of these coins for weight amounted to 136, the total number weighed being 2,720. The average weight of all was 180·037 grains; the lightest and heaviest coins weighed were respectively 179·10 and 180·90 grains.

The trials for fineness were also 136; 680 coins having been assayed singly and 3,400 in groups of 25 coins after melting. Of the coins assayed singly the extreme variations in fineness ranged from 914·3 to 918·6 and the average fineness over 680 coins was 916·569 per mille. None of the coins was found beyond remedy. The 3,400 coins assayed in groups of 25 after melting gave an average fineness of 916·618, the lowest and highest figures obtained for any melting of coins being respectively 915·1 and 917·8.

The average results are shown in the following table :—

Months.	Average weight of pyx Rupees, grains.	AVERAGE FINENESS OF PYX RUPEES PER MILLE.		Gold per mille.
		Single.	Melted.	
April 1911	180·031	916·867	916·700	·034
November „	180·044	916·427	916·523	·278
December „	180·047	916·472	916·575	·284
January 1912	180·046	916·541	916·436	·169
February „	180·000	916·518	916·671	·316
March „	180·019	916·733	916·756	·141
Average	180·037	916·569	916·618	·218

7. *Half Rupees.*—The trials of these coins for weight amounted to 9, the total number weighed being 180. None of these was found beyond remedy. The average weight of all was 90·037 grains; the lightest and heaviest coins weighed respectively 89·60 and 90·40 grains.

The trials for fineness were 9 in number: 45 coins were assayed singly and 450 in groups of 50 coins after melting. Of the coins assayed singly the extreme variations in fineness ranged from 915·5 to 918·3 and the average fineness over 45 coins was 916·920 per mille. No coin was found beyond remedy. The 450 coins assayed in groups of 50 after melting gave an average fineness of 916·755, the lowest and highest figures obtained for any melting of coins being respectively 916·2 and 917·0.

The average results are shown in the following table :—

Months.	Average weight of pyx ½-rupees, grains.	Average fineness of pyx ½-rupees per mille.		Gold per mille.
		Single.	Melted.	
May 1911 . . .	90·070	916·600	916·600	·032
June „ . . .	90·021	917·080	916·833	·016
Average .	90·037	916·920	916·755	·022

8. *Quarter Rupees.*—The trials of these coins for weight amounted to 13, the total number weighed being 130. None of these was found beyond remedy. The average weight of all was 45·054 grains; the lightest and heaviest coins weighed respectively 44·70 and 45·30 grains.

The trials for fineness were also 13 in number, 65 coins having been assayed singly, and 1,300 in groups of 100 coins after melting. Of the coins assayed singly the extreme variations in fineness ranged from 915·2 to 917·6 per mille, and the average fineness of the 65 coins was 916·637 per mille. The 1,300 coins assayed in groups of 100 after melting gave an average fineness of 916·600, the lowest and highest figures obtained for any melting of coins being 915·7 and 916·9 per mille.

The average results are shown in the following table :—

Months.	Average weight of pyx ¼ Rupees, grains.	Average fineness of pyx ¼ Rupees per mille.		Gold per mille.
		Single.	Melted.	
May 1911 . . .	45·05	916·573	916·617	·044
June „ . . .	45·05	916·691	916·585	·020
Average .	45·054	916·637	916·600	·030

9. *One-eighth Rupees.*—The trials of these coins for weight amounted to 23, the total number weighed being 230. None of these was found beyond remedy. The average weight of all was 22·51 grains: the lightest and heaviest coins weighed respectively 22·30 and 22·70 grains.

The trials for fineness were 23 in number, 115 coins having been assayed singly and 4,600 in groups of 200 coins after melting. Of the coins assayed singly the extreme variations in fineness ranged from 915·7 to 918·3 per mille and the average fineness of the 115 coins was 916·915 per mille. The 4,600 coins assayed in groups of 200 after melting gave an average fineness of 916·822, the lowest and highest figures obtained for any melting of coins being 916·2 and 917·3 per mille.

The average results are shown in the following table :—

Months.	Average weight of pyx ½ rupees, grains.	Average fineness of pyx ½ rupees per mille.		Gold per mille.
		Single.	Melted.	
May 1911	22·52	916·769	916·745	·242
July „	22·51	917·048	916·892	·067
Average	22·516	916·915	916·822	·149

10. *British Dollars.*—The trials of these coins for weight amounted to 403, the total number weighed being 8,100. Two trials disclosed two coins below the legal remedy. Forty fresh coins were weighed and found to be within remedy. The average weight of all was 416·011 grains; the lightest and heaviest coins weighed were respectively 414·10 and 417·90 grains.

The trials for fineness were 403 in number, 2,015 coins having been assayed singly and 6,045 in groups of 15 coins after melting. Of the coins assayed singly the extreme variations in fineness ranged from 893·6 to 902·3 per mille, and the average fineness of the 2,015 coins was 900·168 per mille. The 6,045 coins assayed in groups of 15 after melting gave an average fineness of 899·991, the lowest and highest figures obtained for any melting of coins being 899·1 and 901·0 per mille.

The average results are shown in the following table :—

Months.	Average weight of pyx British Dollars, grains.	Average fineness of pyx British Dollars per mille.		Gold per mille.
		Single.	Melted.	
April 1911	416·015	900·365	900·047	·095
May „	416·033	900·170	900·062	·061
June „	416·070	900·102	899·950	·143
July „	416·021	900·096	899·887	·081
August „	415·993	900·160	899·903	·021
September „	415·980	900·244	900·038	·009
October „	415·986	900·212	900·013	·032
November „	416·009	900·301	900·219	·017
December „	416·014	900·018	899·862	·018
January 1912	416·030	900·077	899·919	·032
February „	415·975	900·163	899·922	·059
March „	416·004	900·229	899·977	·051
Average	416·011	900·168	899·991	·041

11. *Ten Cent pieces.*—The trials of these coins for weight amounted to 4, the total number weighed being 40. None of these was found beyond

remedy. The average weight of all was 41·93 grains; the lightest and heaviest coins weighed respectively 41·70 and 42·10 grains. The trials for fineness were also 4 in number, 20 coins having been assayed singly and 400 in groups of 100 coins after melting. Of the coins assayed singly the extreme variations in fineness ranged from 597·7 to 602·4 per mille, and the average fineness of the 20 coins was 600·305 per mille. The 400 coins assayed in groups of 100 after melting gave an average fineness of 600·025, the lowest and highest figures obtained for any melting of coins being 599·3 and 601·1 per mille.

The average results are shown in the following table:—

Months.	Average weight of pyx ten cent pieces, grains.	Average fineness of pyx 10 cent pieces per mille.		Gold per mille.
		Single.	Melted.	
August 1911	41·92	599·680	600·500	·035
January 1912	41·94	600·513	599·866	
Average .	41·937	600·305	600·025	·035

12. *Five Cent pieces.*—The trials of these coins for weight amounted to 11, the total number weighed being 110. None of these was found beyond remedy. The average weight of all was 20·96 grains; the lightest and heaviest coins weighed respectively 20·85 and 21·05 grains.

The trials for fineness were also 11 in number, 65 coins having been assayed singly and 2,200 in groups of 200 coins after melting. Of the coins assayed singly the extreme variations in fineness ranged from 596·1 to 603·9 per mille, and the average fineness of the 55 was 599·237 per mille. In two trials only were single coins found to be outside remedy, and the fresh pyx called for in these cases disclosed no coin beyond remedy.

The 2,200 coins assayed in groups of 200 after melting gave an average fineness of 599·718; the lowest and highest figures obtained for any melting of coins being 596·7 and 606·6 per mille.

The average results are shown in the following table:—

Months.	Average weight of pyx five cent pieces, grains.	Average fineness of pyx five cent pieces per mille.		Gold per mille.
		Single.	Melted.	
April 1911 . . .	21·01	600·153	600·866	·108
May „ . . .	21·03	600·000	600·300	
July „ . . .	20·93	599·145	599·400	·058
August „ . . .	20·98	599·240	598·900	
January 1912 . . .	20·91	597·660	598·750	·040
Average .	20·963	599·237	599·718	·078

13. *The copper and nickel assays.*—The copper and nickel assays done during the year are given in the following table :—

Months.	Description of coins.	Number of coins.	Copper.	Fineness present.			
				Nickel.	Iron.	Carbon.	Silica.
April 1911 .	Nickel and one anna pieces.	95	74·45	25·10	Undetermined.		
May „ .	Ditto .	60	74·80	24·75	Ditto.		
June „ .	Ditto .	125	74·73	25·01	Ditto.		
July „ .	Ditto .	115	75·22	24·46	Ditto.		
August „ .	Ditto .	120	74·80	25·10	Trace.		
September „ .	Ditto .	115	74·70	25·20	Do.		
October „ .	Ditto .	105	75·00	24·40	Iron present but not determined.		
November „ .	Ditto .	115	74·00	25·40	Ditto.		
December „ .	Ditto .	120	74·60	24·40	Ditto.		
March 1912 . .	Ditto .	70	74·40	24·60	Ditto.		
		Tolas.					
1st June 1911 .	Nickel supplied by Mint Master.	50	·050	99·35	Undetermined.		
6th October „ .	Ditto .	50	·030	99·75	·28 trace of carbon.		
3rd November „ .	Ditto .	50	·013	99·40	·23		

14. *Summary of pyx trial.*—The results detailed in paragraphs 6, 7, 8, 9, 10, 11 and 12 are summarised in the following table :—

Denominations.	Number of coins weighed singly.	Number of coins assayed singly.	Number of coins assayed after melting.	Average weight (grains).	Average fineness of coins assayed singly (per mille).	Average fineness of coins assayed after melting (per mille).	Proportion of gold in pyx coins (per mille).
Rupees	2,720	680	3,400	180·037	916·569	916·618	·218
½ Rupees . . .	180	45	450	90·037	916·920	916·755	·022
¼ Rupees . . .	130	65	1,300	45·054	916·637	916·600	·030
⅛ Rupees . . .	230	115	4,600	22·516	916·915	916·822	·149
British Dollars . .	8,100	2,015	6,045	416·011	900·168	899·991	·041
Ten cents . . .	40	20	400	41·937	600·305	600·025	·035
Five cents . . .	110	65	2,200	20·963	599·237	599·718	·078

15. *Miscellaneous assays.*—Of the 343 assays under the "Assays on various metals and ores" in paragraph 2 of this report, 286 were assays on counterfeit coins, and samples of nickel and copper received from the Mint Master, Bombay, Administrator, Junagadh, and Superintendent, Army Clothing Factory, Madras.

16. *Verifications of weight pieces.*—During the year the Mint and Assay Office weights have been verified starting from the Iridio-platinum primary

weight of 30 tolas as basis. These weights have also been adjusted when necessary.

17. Lieutenant-Colonel A. Milne, I. M. S., Assay Master, retired from 25th July 1911 and Lieutenant-Colonel J. Lloyd Jones, I. M. S., held the post of Assay Master, Bombay, from 25th July 1911. Major J. J. Bourke, I. M. S., Deputy Assay Master, Bombay, was transferred to Calcutta as Assay Master, and Captain H. B. Drake, I. M. S., held the post of Deputy Assay Master, Bombay, from 20th July 1911.

18. Mr. H. C. Crisp, the 1st Assistant to the Assay Master, Bombay, retired on pension on 1st June 1911, and Mr. U. A. Spence, the 2nd Assistant, has been promoted to 1st Assistant: the post of 2nd Assistant has been held by Mr. H. B. Graveston, who was transferred from the Commissioner's Office, Karachi.

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A MONOGRAPH

GOLD AND SILVER WORK

IN THE BENGAL PRESIDENCY

BY

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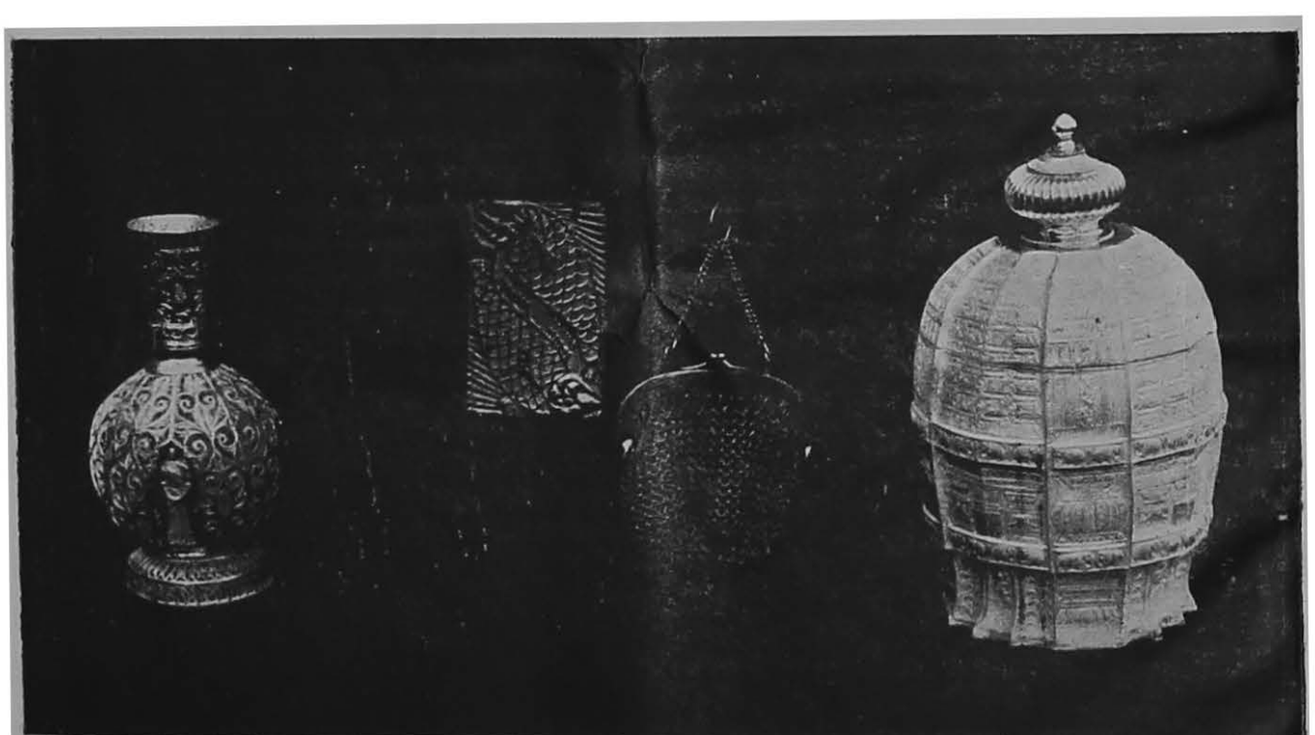
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Casket.



Vase. Cardcase. Purse. Powder-box.

From the Orissa Art Union, CUTTACK.

TABLE OF CONTENTS.

		PAGE
CHAPTER	I.—Introduction	1
,,	II.—Antiquity of the Art in India	*ib.*
,,	III.—Alloys and Refining Processes	2
,,	IV.—Implements and Working Methods	4
,,	V.—Present Condition of the Art in the Province	6
,,	VI.—The Goldsmith's Art under Native and British Rule	15
,,	VII.—Conclusion: Indian *vs.* European Jewellery	17

A MONOGRAPH ON GOLD AND SILVER WORK

IN THE BENGAL PRESIDENCY.

CHAPTER I.—INTRODUCTION.

The Metals.—The colour, lustre and power of resistng oxidation which gold and silver possess have caused them to be valued from the earliest ages. Their malleability, ductility and power of taking a high polish are other qualities that render them peculiarly suitable for artistic treatment. One grain of pure gold can be beaten into leaves which cover a surface of 54 square inches and are only $\frac{1}{282,000}$th of an inch thick. And the same weight may be drawn into a wire 800 feet in length. Silver is less remarkable for these qualities. It further labours under the disadvantage of getting tarnished by the action of sulphuretted hydrogen gas (forming sulphide of silver) which is always present in the atmosphere of inhabited places and is exhaled in minute quantities by the human body.

The World's Output of Gold and the Contribution of India.—In 1899 the total output of gold in the world was over 15 million ounces against less than five millions in 1881. The production in the United States increased during this period from one million seven hundred thousand ounces to three millions eight hundred thousand ounces. Undoubtedly the greatest gold discovery made in the latter half of the 19th century (1885) was that of Witwatersrand district in the Transvaal. In 1899 it yielded just a little more than 25 per cent. of the whole world's production. India has likewise been added to the list of regions not previously important as gold producers which now contribute to the world's output. Its active production began about the same time as that of South Africa. In 1903 the annual produce of India rose to over 600,000 ounces valued at about three crore rupees and a half. This came almost wholly from the quartz veins of the Colar gold-fields in Mysore, Southern India.

CHAPTER II.—ANTIQUITY OF THE ART IN INDIA.

Gold and silver were not only known in the Vedic period, but were worked into ornaments of various descriptions. Originally the word *loha* simply meant a metal, and gold was known as *yellow*, and silver as *white*, loha; but later on the word *loha* came to stand for iron alone (Dr. P. C. Roy—Hindu Chemistry).

Antiquity of Gold and Silver as Elements of Ornament.—Judging from the relics and records that have come down to us, passion for personal decorations seems to have assumed in ancient India the form of an inordinate fondness for gold jewellery. Both social and climatic conditions contributed to the devolpment of this taste. It is in curious contrast to the general simplicity of Indian life, and did not escape the attention of foreign travellers like Megasthenes (310 B. C.)

The gods of the Rig-Veda constantly present themselves adorned with a variety of jewels. Rudra is described as "firm with strong limbs, assuming many forms, fierce and tawny-coloured, shining with brilliant golden ornaments." (Wilson's Rig-Veda, II, 221.) The Maruts, the Aswins, and even the Asuras have various ornaments and plenty of gold and jewels. The sage Kakshivat, the reputed author of several of the hymns of the Rig-Veda, prays for a son "decorated with golden ear-rings and a jewelled necklace." The references to jewellery in the Ramayana and Mahabharata are too numerous for

quotation. Sita is represented as "arrayed for her marriage with Rama in a light rosy-red *sari* embroidered with gold, with jewelled butterflies in her raven black hair. Her ears are resplendent with gems; she has bracelets and armlets and anklets of gold, and a golden zone binds her slender waist. She has jewelled rings on her fingers and golden bells on her toes that tinkle as she walks with naked feet." In the Ayodhya Kanda of the Ramayana the inhabitants of that city are represented as going out in procession with Bharata to seek Rama in the order of their trade guilds: jewellers, potters, ivory-workers, perfumers, goldsmiths, weavers, carpenters, painters, musical instrument makers, blacksmiths, coppersmiths, cutters of crystals, glass-makers, in-layers, and others. Again in the Mahabharata, at the gambling match at Hastinapur, Yudhisthira is described as losing "first a very beautiful pearl; next a bag containing a thousand pieces of gold; next a piece of gold so pure that it was soft as wax; next a chariot set with jewels and hung around with golden bells; next 1,000 war elephants with golden *howdahs* set with diamonds; next 100,000 slaves all dressed in good garments; next 100,000 slave girls adorned from head to foot with golden ornaments; next all the remainder of his goods; next all his cattle; and then his whole kingdom, excepting only the lands he had granted to the Brahmins." It would be a commonplace remark to say that all this need not be literally true in every detail; but it abundantly proves that at the time of the composition of these grand old epics gold and gem-set ornaments and plates were in common use in the Royal Courts of India. In the Sarada Tilaka (Wilson's Hindu Theatre, II, p. 385) mention is made of an Andhra lady "whose graceful ear is decorated with a scroll of gold, whose nose-ring, set with pearls, trembles to her breath; and over whose bosom spreads the safron-dyed vest." In the first century, before the Christain era, Sudraka, in his play of the "Toy Cart," did not think it inconsistent to describe in the courtyard of a courtezan's house jewellers' shops "where skilful artists were examining pearls, topazes, saphires, lapis-lazuli, coral, and other jewels. Some set rubies in gold, some string gold beads in coloured thread, some string pearls, some grind lapis-lazuli, some cut shells, and some turn and pierce coral."

Continuity of Indian Social Life, and with it of the Indian Arts.—In the Nirukta or Etymological Glossary of the Vedas, and in the Grammar of Panini, who is supposed to have lived in the 4th century B. C., the names of various kinds of jewels are given which are still the current names throughout India. But, though the names have come down in an unbroken tradition, fashion has changed the forms of many of them. The sculptures of Bhubaneswar, in Orissa, as pointed out by Dr. Rajendra Lala Mitra, afford us a pretty fair idea of what their shapes were twelve hundred years ago. The bas reliefs of Sanchi (150 B. C.) and Amaravati (second century A. D.) also exhibit specimens of a great variety of ornaments for the hands, feet, waist, neck, and head. On the whole there has been a gradual, steady, and marked advance towards refinement.

"The bangles, bracelets, anklets of Sanchi are the clumsiest possible. They are thick, rough, heavy, and almost devoid of workmanship . . . . . The bangles and armlets of Amaravati, though mostly of the same patterns, are smaller, lighter, and neater, and the anklets are somewhat less ponderous. At Bhubaneswar they are not only reduced in size and weight but greatly improved in appearance."

But in many instances the very forms shown in the ancient sculptures have actually come down to us, and may be seen any day among the unsophisticated classes remote from towns, where modern influences on fashion have not penetrated yet. In India things move slowly. The life and arts here are still indeed the life and arts of antiquity.

CHAPTER III.—ALLOYS AND REFINING PROCESSES.

Alloys of Gold and Silver.—When pure gold is almost as soft as lead. Its melting point is somewhere between 1,200° to 1,425°C. The metal which is used by the goldsmith and for coinage is an alloy of gold with copper and sometimes with silver. This alloy not only melts more easily, but is also harder and does not so readily wear away when used. The yellow colour is

sensibly lowered by small quantities of silver and brightened by copper. In England the fineness of a sample of gold is expressed in *carats*, pure gold being said to be 24 carats. English sovereigns and half-sovereigns are made of 22 carat gold, or contain 22 parts of pure gold alloyed with 2 parts of copper (91·66 and 8·33 per cent., respectively). In the manufacture of English jewellery 15 or 12 carat gold is usually employed, but Indian goldsmiths generally use a much finer metal. Pure silver, though harder than pure gold, is yet too soft for ordinary wear. The addition of a few parts per cent. of copper considerably increases it in hardness and makes it more suitable for ordinary purposes. Alloys of silver containing 10 or 20 per cent. of copper are quite white. English silver coins contain 92·6 per cent. of silver and 7·5 per cent. of copper.

Solder—which plays such an important part in the manufacture of gold and silver articles—is an alloy with a much lower melting point than the stuff of which the body and parts are made. Small quantities of the solder with a little solution of borax are placed upon the parts that require cementing and melted under the blow-pipe. Solder for gold articles is generally thus made:—

Gold	....	16 parts.
Silver	... ...	1½ to 2½ „
Copper	... ...	1½ to 2½ „

No zinc is used in preparing the solder for gold in Orissa, but in Bengal from 1 to 1½ parts of zinc are added to the above.

But the percentage of gold in the solder is largely a question of remuneration. If the wages promised are low, the goldsmith pays himself by increasing the proportion of the cheaper metals.

The solder for silver articles is generally prepared thus:—

Silver	... ...	16 parts.
Copper	... ...	2 „
Zinc	... ...	4 „

Refining Processes.—Gold is separated from silver when the two are found in an alloy by beating it out into a thin sheet, coating it with a paste of common salt and brick-dust moistened with a little mustard oil or water, and burning it several times in a fire of cowdung cakes.

It may be interesting to observe that it is essentially the same method as was in vogue in Europe in ancient days. Strabo (first century A.D.) says that in his time gold in large quantities was refined by burning it with an aluminous earth which by destroying the silver left the gold in a state of purity. Pliny shows that for this purpose the gold was placed on the fire in an earthen vessel with treble its weight of salt, and that it was afterwards again exposed to the fire with two parts of salt and one of argillaceous rock.*

In Calcutta and other large towns gold is now separated from silver by the action of nitric acid. This is a modern method which our goldsmiths have no doubt learnt from the example of the European firms in which many native workers are employed. For this purpose the gold is first melted with some more silver and poured into a vessel of water when the mass breaks up into small particles (*pinjar*). The purer the gold, the larger is the quantity of silver required to mix with it. This is known as *quartation*, from the fact that the alloy best suited for the operation contains in every four parts three parts of silver and one part of gold. Thus, if it is about 15 carats, one and-a-half times its weight of silver will suffice; but if it is about 18 carats, double its weight of silver will be necessary for mixing with it. The small pieces obtained by pouring the melted alloy into water are next heated with strong nitric acid in an enamelled pot. The silver dissolves in the nitric acid, forming silver nitrate and leaving the gold behind in the form of dust; but the process has to be repeated four or five times before the dust is quite pure. The particles left behind are next melted in a crucible with a little saltpetre and borax, when a quantity of pure gold is obtained.

* The chemistry of the process is simple: silicate of soda was formed, and the chlorine being set free attacked the silver. The chloride of silver fused readily and dropped off exposing a fresh surface of the alloy to the action of the gas.

The silver is afterwards recovered by placing a plate of copper in the silver nitrate solution. The copper takes the place of the silver, copper nitrate being formed and silver being set free. The latter forms a deposit on the surface of the copper plate as a soft, fine, spongy mass. The common method of refining silver is by mixing it with its equal weight of lead in a pit lined with quicklime and ashes. A fire of charcoal is built upon the pit and blown into from above. The lead is oxidised to lead-oxide, which melts as it is produced, and is partly blown off and partly absorbed by the porous lining of the pit. When all the lead has been removed, the bare surface of the molten silver flashes out perfectly bright. This process is known in Europe as *cupellation*, and is carried out on a large scale in specially constructed reverberatory furnaces.

CHAPTER IV.—IMPLEMENTS AND WORKING METHODS.

Implements.—A request to see their tools is generally answered by the production of one or two coverless tin-boxes containing what may be shortly described as antique scrap iron. A small hole in the mud floor to do service as a furnace, an earthenware bowl and a couple of fans, generally innocent of handles, form the *tout ensemble* of the jeweller's shop. Technical skill and artistic perception are by no means wanting, and it is often astonishing to see how these men, working in a trying light with the crudest of crude tools in little huts a few feet square, turn out articles of exquisite design and perfect proportion. The tools are generally made by the goldsmiths themselves and are very much the same all over the Province. One of the plates gives some idea of those used in Cuttack.

The Processes.—The methods of producing works of art from gold and silver are as follows:—

(*a*) Repoussé hammering (*nakashi* work).
(*b*) Filigree or filigrane.
(*c*) Engraving.
(*d*) Die-stamping.
(*e*) Damascening or inlaying (*bidri* work).
(*f*) Casting or moulding.

(*a*) *Repoussé hammering or nakashi work.*—The principle of the process is very simple. When a thin sheet of paper is pressed with a blunt instrument against a pad a depression is produced appearing as an elevation on the opposite side. If a design is first traced on the paper it can thus be easily reproduced in relief. In the case of gold and silver a thin sheet of the metal is fixed upon a bed of sál resin (exudation of *Shorea robusta*), brick dust and mustard oil melted together. This is known as *jow gálá* (Sanskrit *játu*). As the composition cools and hardens it holds the sheet in position upon which the requisite design is now traced. A steel nail called *chheni* and a small hammer are now used in making depressions on the sheet as required according to the design. The sheet is next taken out of the bed and remounted inside out showing the design in relief. The nail and hammer follow again depressing the ground still more and bringing the design out more clearly in all its details.

(*b*) *Filigree or filigrane.*—Cuttack is particularly famous for this style of work. A pretty thick wire is roughly produced by hammering the metal and then the wire is pulled through a series of graduated holes in a steel plate. This makes the wire finer and finer, till at length the requisite diameter is obtained. The wire is now cut up, bent and coiled into various sizes and shapes and arranged according to design on a piece of mica placed over a tin plate. The pieces are now soldered together under a blow-pipe one by one.

(*c*) *Engraving*—Is done by cutting into the surface of the metal with small triangular pointed chisels according to designs.

(*d*) *Die-stamping.*—There are steel and bell-metal dies of various patterns produced by engaving. Gold or silver sheets are placed upon these patterns and on the top of the sheets a piece of lead. By gently hammering on the lead the gold or silver sheet below is pressed into the engraved pattern. A plain back is now soldered on to the stamped sheet and the space between the

front and back filled with shellac giving the article a solidity and enabling it to stand wear and tear. When the customer can afford to supply the metal in sufficient quantity for a solid article simple hammering over the die is enough.

The stamped surface is afterwards variously ornamented by repoussé hammering in the case of the thin sheets or by engraving and "diamond" cutting in the case of the solid pieces.

(*e*) *Damascening or Bidri work.*—This is a declining industry, practised only to a very small extent in one or two districts in Bengal, viz., Purneah and Murshidabad. It consists in in-laying gold or silver plates into a surface of vessels made of an alloy of zinc and copper. Various designs are engraved or carved on the surface and gold or silver plates cut in the exact measures are placed on the corresponding cavities and hammered in. Finally a permanent black colour is given to the ground with a solution of salammonic and saltpetre. The black colour of the ground shows off the gold and silver ornamentation by contrast. Vases, cups, *hookahs*, spittoons are thus decorated. The name *bidri* is derived from Bidar in the Nizam's dominions, the chief centre of the industry in India and, according to tradition, its original home.

(*f*) *Casting or moulding*—Is hardly ever practised with gold and only to a very small extent with silver. A wax model is made and coated over with a thin layer of liquid clay. This is allowed to dry and harden when another layer of clay is put on and yet another till there is a pretty thick crust of clay on the surface. The whole is now heated in a fire when the wax melts and runs out through a hole left for the purpose, leaving a hollow mould of burnt clay. When melted silver is poured into the mould the original wax figure is exactly reproduced in all its details. Sometimes the mould is made of damp sand placed in two shallow iron boxes. In such cases the original must be of some hard substance. Impressions of the front and back are taken separately in the damp sand and the two halves are held in position by being firmly locked together after a hole is made in the mould to admit the molten silver. The metal is poured in and when it has had time to cool, the mould is broken up and the cast is obtained.

Silver cups, tumblers, dinner plates, *garoos* (spouted jugs) and *kalsis* (water pots) are common enough in the houses of well-to-do people; these, however, are not made by casting like bell-metal or brass utensils but by hammering the silver into the requisite shapes.

Colouring, cleaning and finishing.—For articles made of gold the process consists in melting together over a fire—

Salt (common)	...	...	... 1 part.
Alum	...	...	... 1 ,,
Saltpetre	...	...	... 2 parts.

and a little water. When boiling more water is added and the gold articles are put in only for 5 to 10 minutes. The articles are now taken out, washed with *ritha*-water and burnished with brass wire brushes. This makes the things very bright, but if kept too long in the solution they lose in weight, the gold getting dissolved.

In Cuttack a *paste* is made of these substances instead of a solution and the article to be coloured is coated with the paste and dried. If, however, the gold is more or less pure, the saltpetre is dispensed with, but in that case the article after being coated over with the paste of common salt and alum is burnt in the fire.

The chemistry of the thing is simple. The mixture sets free nitromuriatic acid (*aqua regia*) which dissolves the baser metals more than the gold. Thus a surface is obtained of pure gold even when the metal used is not pure.

In Bengal a high (almost red) colour is given to the gold articles. The colour lasts only a few months depending upon the amount of use. Even inferior gold looks as bright as pure gold under this treatment. It is done in this way: A couple of pieces of raw tamarind are boiled in their shells over a slow fire. The shells are then cast away and the pulp is mixed with a little water. A stock solution of common salt and alum is next taken and brought to a boil in an earthen pot. The tamarind water is now added to this, the requisite strength being ascertained by actual tasting. Just a trace of fine sulphur paste is added to this. After about half an hour while the whole is briskly boiling, the gold articles are put in and stirred with a wooden stick.

They are examined at first every minute, and later, as the colour comes on, almost every two or three seconds to prevent them getting overcoloured. When the right shade has been obtained, they are taken out and placed in cold water. Then they are wiped dry with a piece of cotton cloth. Lastly, they are put in hot sand to expel the water from inside the hollow tubes, if any. This colouring is much appreciated by Bengal women, but is not to the taste of women in other Provinces. The colour, as already mentioned, lasts only a few months.

Silver things (if made of pure silver) are cleaned by coating them with a thin paste of saltpetre and charcoal and then burning them over a fire. If, however, the silver is not pure, a little borax is also added to the paste. The process followed in Cuttack is to put them in a solution of ripe tamarind and then burn them. The process is generally repeated two or three times. They are next put in a boiling mixture of lime-juice and water. When lastly washed with *ritha*-water* they look snowwhite.

Silver things are also cleaned by boiling them in a solution of a bye-product or *gâd* (acid potassium sulphate?) of nitric acid factories. The articles are boiled in the solution and then taken out and washed with cold water. This is a new process learnt by the native goldsmiths from the example of the European jewellers of Calcutta.

CHAPTER V.—PRESENT CONDITION OF THE ART IN THE PROVINCE.

Supply of Gold and Silver.—Besides what the country produces, gold and silver are imported by the Indian Exchange Banks. On an average English or Australian bar or China leaf (100 touch) sells from Rs. 24 to Rs. 25 per tola, while silver sells from Rs. 72 to Rs. 75 per 100 tola. Marwari merchants buy the metals from the banks and supply them all over the country. Besides these, old coins, especially Joypur mohurs, and modern English sovereigns are used in making into ornaments. Old ornaments themselves are also largely changed into new shapes and forms.

The material is generally advanced by the customers, but people who can afford to pay good prices for fancy work order them from Calcutta, Cuttack or Dacca. This discourages the local workmen who fall back upon the poor and the middle classes for their subsistence. For these reasons excellence of workmanship is sacrificed to the quantity of outturn, with the result that art becomes degenerated.

Census.—According to the Census returns of 1901 the total number of actual workers in gold, silver and precious metals was in that year 102,377 males and 2,654 females, besides 9,135 persons of both sexes who were also partially agriculturists. Thus the total number of workers were 114,116. These, together with their dependents, numbered slightly under three lakhs and a quarter. The number of men and women of the Sonar caste alone came to about two lakhs and-a-half, showing that the trade is far from being a monopoly of the goldsmith caste.

In most districts the goldsmiths are greatly handicapped by the absence of a designer. It is inevitable under the circumstances that the imitative faculty should be devoloped at the expense of the creative. They execute orders, but do not launch out on a new idea, while they seldom or never turn out a piece of original work; they can copy even an intricate pattern wonderfully well. But unless they are making some new design to order, they have no pattern before them, and they make again what they and their fathers have made so often before.

The following is a description of the principal gold and silver vessels :—

The vase, dish, rose-water sprinker, *attar* tray and *hukkas* are objects which the higher classes use in table service, or on occasions of weddings, or in ceremonials, such as darbars and formal meetings, and represent the plate of a European establishment displayed on special occasions. All Indian potentates

* *Ritha* is *Sapindus Mukrossi* or soap-nut.

have sets of more or less magnificence of silver, or gold-plated or gold, sometimes of gold inlaid with precious stones. The rich merchants and those accustomed to entertain visitors with some ceremony also have their modest equipment of silver platters for pan-leaf, boxes for the betel-nut, and a vase or bottle for *attar* of roses, and rose-water offered to the guest. The high European officials who hold darbars are also provided with sets of these necessary ceremonial accompaniments, and some of this plate handed down from the days when everything in India was done on a magnificent scale is very handsome.

Lord Clive used the darbar sets in the ceremonial receptions, and took them to England. The rose-water vases or sprinklers are used throughout India on occasions of weddings, nautch parties and ceremonial meetings; and visitors are served with betel-leaves and areca-nuts and *attar*, and are sprinkled with rose water from silver vases. Native visitors receive *attar* and rose water on their clothes, but European gentlemen receive their share on their handkerchiefs; and at the close of a darbar also the visitors are served with betel-leaves and areca-nuts, and are sprinkled with rose water from silver vases of this sort.

There is hardly an important village in the Province without a goldsmith's shop; but, despite the universality of the trade, there is nothing particularly noticeable in the style of the articles produced excepting in the two important centres of Cuttack and Dacca. An account is given below of the condition of the industry at these and a few other selected centres at the present time. Calcutta has naturally attracted to itself the best artists from the interior, and excellent specimens of gold and silversmith's workmanship can be seen in many places in the metropolis and its suburbs:—

Cuttack District.

Gold and Silversmiths as a Caste.—The gold and silversmiths of the district belong to the Baniya, Bais Baniya, and Subarnabanik castes as distinguished from the Gandharbaniks, and are commonly known as Baniyas. They pride themselves as belonging to one of the twice-born (that is, Vaisya) castes. They wear the *paita* or sacred thread on the occasion of their marriage, and get their daughters married between the ages of seven and eleven. Their widows do not eat meat and fish, and there is no widow-marriage among them.

About 400 families live in the town of Cuttack and about 2,000 families of gold and silversmiths live also in the interior of the district.

People of other Castes working as Gold and Silversmiths.—In the town of Cuttack there are some Brahmins, *saniyasis*, *gurias*, *telis*, and *jyotishes* working as gold and silversmiths.

Goldsmith's Instruments.—The principal instruments used by the local goldsmiths are—(1) the *gharia* (crucible for melting), (2) the *háturá* or *háturi* (hammers of various sizes), (3) *sandasi* (tongs), (4) *nali* (blow-pipe), (5) *chimtá* (forceps), (6) *nehi* (anvil), (7) *janta* (an iron bar with a series of graduated bores for drawing gold and silver wires), (8) *siári* (heavy pincers for pulling wires), (9) *patangir* and *pilás* (light pincers for pulling wires), (10) *mekraz* or *kainchi* or *katri* (shears and snips), (11) the *kalam* (punch for chasing), of various sizes, (12) the *thosa* (an iron or bell-metal die with various engraved designs), (13) the *salai* (iron chisels for engraving), (14) the *bálánchá* (hand-brush made of hog's hair), (15) the *meghnála* (mica plates over which wires are arranged for filigree works), (16) the *kansule* (a bell-metal cube for shaping round ornaments, *e.g.*, *ghungras*), (17) the *goba* (an iron pencil-shaped instrument with a round top for pressing the metal over the *kansuli*, (18) the *moskola* (an instrument for polishing gold and silver work), (19) the *sohana* (file), (20) the *dhalá* or ingot-mould (a brick with a hollow in it for pouring in melted gold or silver), (21) the *umchi* (stone), (22) compasses, (23) the *tára gora nali* (wooden cylinder about which gold and silver wires are wound), (24) the *hatol* (an iron needle over which gold and silver wires are wound for making chains).

Alloys.—The silversmiths by mixing zinc at the rate of from 4 annas to 6 annas weight in the rupee with *chandi* (or pure metal) make a kind of alloy known as the *kámsár* or *mohurá*, and by mixing copper at the rate of from 4 annas to 6 annas weight in the rupee with *chandi* make another kind known

as the *kala* silver. Ornaments used by the poorer classes are ordinarily made of *mohurá* or *kala* silver. *Mohurá* sells at the rate of 9 and 9½ annas and *kala* silver at 7 and 8 annas per *bhari*.

Filigree Work.—It is done with good gold or *chandi* silver with an alloy as noted below. A *bhari* of pure gold is alloyed with copper and *chandi* silver in proportions of 16 : 1 : 1. A *bhari* of *chandi* is similarly alloyed with copper in proportion of 16 : 0½. The alloy is then made into a rough sort of wire which is passed through the *janta* (a bar of steel with bores of different sizes in it) and pulled hard till the wire lengthens. Four or five kinds of wires (*i.e.*, of different thickness) are thus made and cut according to sizes required.

Over a tin-plate a piece of mica is placed. The thick wires are then arranged over the mica plate according to the outlines of the design. The wires next in thickness are then placed near the thick wires as required by the design. They are then soldered with *pán*. Two or three of the finest wires are then twisted and heated and hammered gently on one side, so as to form a fine silver ribbon with a ribbed edge. They are then cut into bits according to the sizes required and bent according to the work to be done. Each bit of wire is then set for ornamental purposes in small coils in the midst of the previously set thicker wires. When the different kinds of wire have been arranged, they are cemented together with *pán* by putting the plate over the fire.

Exports and Imports.—No accurate information as to the quantity of gold and silver imported and exported can be had; but as a matter of fact about Rs. 1,00,000 worth of gold and about Rs. 3,25,000 worth of silver are imported into Cuttack annually, and gold and silver ornaments and fancy articles are exported not only to Puri and the Tributary States in Orissa, but to Calcutta, Delhi, Bombay, Cutch, Bangalore, Akyab, Mauritius, and other places.

Names of principal kinds of Ornaments, Plates, etc., made in Cuttack.—

I.—Ornaments for the head—

(1) *Alaka* or *Sinti*, for the forehead.
(2) *Chour Bhundi* (a hair-pin with four or five chains suspended from it).
(3) *Guji Kathi* (a hair-pin worn above the *Chour Bhundi*).
(4) *Mallikâ Karha Mâla* (a string of buds of *Mallikâ* or *Bel* flower, worn round the tuft of hair).
(5) *Mathâ Mâlis* and *Deunriás*, of various sorts, worn round the tuft of hair.
(6) Various kinds of flowers, *e.g.*, rose, *champá*, *chameli*, chrysanthemum, etc., of filigree work (used as hair-pins).

The above are made either of gold or silver.

II.—Ornaments for the ears—

A.—For the lobe of the ear—

(1) *Ganthia*, three spiral-shaped ornaments joined together.
(2) *Kantakari*.
(3) *Chowki*.
(4) *Kápa*.
(5) *Gokhurá*.
(6) *Champá*.
(7) *Noli*.
(8) *Ful jhumka*.
(9) The *Kána* (shaped like the ears and worn over them).
(10) *Makri*, of various sorts.
(11) Earring.

B.—For the sides of the ears—

(1) *Báwli*.
(2) *Gourni Phásiá*.
(3) *Firfirá*.
(4) *Páta*.

C.—For the upper portion of the ear—

(1) *Malkâri*.
(2) *Patá*.

The above are generally made of gold.

III.—Ornaments for the nose—

(1) *Basuni*, a conical-shaped ornament worn through one nostril.
(2) *Ful Guná*, a circular-shaped ornament for the other nostril.
(3) *Natha*, a round nose ornament, made of various patterns.
(4) *Mayur Guna*, a nose ornament shaped like a peacock.
(5) *Nak Machi*, or a fly-shaped nose ornament.
(6) *Nak Chabi*, or a nose ornament shaped like the flower.
The above are for the nostrils only.
(7) *Dandi*, a nose ornament worn at the end of the bridge of the nose: it is shaped like a half-moon.
(8) *Nolaks* (as in Bengal).

The above ornaments are made of gold.

IV.—Ornaments for the neck—

(1) *Chábsiri.*
(2) *Chick.*
(3) *Kanthi* (a string of beads).
(4) *Hára*, of various kinds (neck-chains).

The above are made either of gold or silver.

V.—Ornaments for wrists and lower arms—

A.—Bracelets—

(1) *Kharu.*
(2) *Kangani.*
(3) *Paincha*, of various patterns.
(4) *Churi*, of various patterns.

B.—Armlets—

(1) *Tara.*
(2) *Bahu Sula.*
(3) *Bida* (generally a string of old coins).
(4) *Rasunia.*
(5) *Taita.*
(6) *Ananta.*
(7) *Jasam.*

The above are made either of gold or silver.

VI.—Ornaments for the waist—

(1) *Chandrahár* (consists of from two to five chains fastened together at the end).
(2) *Gotha* (ditto ditto).
(3) *Sutá* or thread (ditto ditto).
(4) *Surjya Hár*, in one chain only.
(5) *Bichha* in two or three chains.

The above are made either of gold or silver.

VII.—Ornaments for the ankles—

(1) *Pancham.*
(2) *Páhura*, worn below the *Pancham.*
(3) *Mála*, worn below the *Páhura.*
(4) *Bala*, which is shaped like a curve, worn below the *Mála.*
(5) *Paw Padma*, which is an arrangement made to cover the feet entirely and connected with five *chutkis* or *jhuntias* (rings for the toes).

(The above are made of gold for use by the *ranis* of Tributary Chiefs only. People of other classes use the above made of silver only. They cannot use gold ornaments for the feet.)

In the interior of the district men of the Kshetriya, Khandait, Guria and Teli castes and Pandits or learned Brahmins use earrings of gold.

Silver Fancy Articles and Ornaments of Filigree Work generally kept for Sale in the Cuttack Market and their Price.—

(1) *Attardan*, of various shapes. Price from Rs. 20 to Rs. 200.
(2) *Golabas*, of various shapes. Price from Rs. 20 to Rs. 60.
(3) *Rekabi* (plate), of different varieties. Price from Rs. 8 to Rs. 50.
(4) *Singhasan* for idols. Price from Rs. 10 to Rs. 100.
(5) *Jhara* with *attardan.* Price from Rs. 40 to Rs 150.
(6) Toy baskets. Price from Rs. 25 to Rs. 100 each.
(7) Vases for keeping flowers. Price from Rs. 16 to Rs. 30.

(8) *Pán Dibi* (betel case). Price from Rs. 10 to Rs. 20.
(9) Necklaces with various kinds of flowers. Price from Rs. 10 to Rs. 20.
(10) Belt. Price from Rs. 4 to Rs. 10.
(11) Hairpins with flowers of various kinds. Price from Re. 1 to Rs. 5 each.
(12) Bracelets, of various patterns. Price from Rs. 8 to Rs. 12 per pair.
(13) *Churis*, of various patterns. Price from Rs. 12 to Rs. 20 per pair.
(14) Brooches with figures of animals. Price from Re. 1 to Rs. 2-8 each.
(15) Dolls, figures of animals, etc. Price from Rs. 3 to Rs. 6 each.
(16) Buttons and studs for shirt. Price from Rs. 1-8 to Rs. 3 a set.
(17) *Hookha* mouthpiece. Price from Re. 1 to Rs. 3 each.
(18) Cigar-case. Price from Rs. 8 to Rs. 12 each.
(19) Card-case. Price from Rs. 8 to Rs. 16 each.
(20) Picture frames.

Orissa Art Union Factory.—But no account of the condition of the gold and silversmiths' craft in the Cuttack district will be complete without mention of the Orissa Art Union Factory of Mr. M. S. Das. In purity of design and delicacy of finish the articles turned out in this factory surpass anything that can be seen anywhere else in the Province to-day. Mr. Das has shown what may be achieved by combining the best hereditary training and talent of the native artist with modern mechanical aid. The venture is full of suggestion and indicates the path that has to be followed in the industrial revival of the country generally.

Dacca District.

Such claim as Dacca can advance to industrial eminence must be based almost entirely on her skill in the textile arts. All her other industries have ever been subordinate to the muslin manufacture for which she is justly famous. And while it is difficult enough to trace out any history of the Dacca muslin industry, we are baffled at every turn when we attempt to get any clear idea of the former days of her gold and silver manufacture. Such of the old writers as mentioned Dacca thought her muslin worthy of, at any rate, a passing reference, but they tell us nothing of the gold and silver. Dr. Taylor, who enters into long details about the muslin, dismisses the gold and silver with a word. "The Dacca workmen," he says, "excel in filigree work. They make bracelets, neck-chains, earrings and other ornaments, and also vessels for *attar* and rose water, all of which are sent to different parts of the country. There are upwards of 300 persons engaged in this business in the city . . . ." Dr. Wise in his "Notes on the Races, &c., of Eastern Bengal" gives us a sketch of the Sonar castes, but we learn little about Dacca from it save that "In Dacca there are about 70 families (*i.e.*, of the Uttar Rarhi Sonars) who are employed as clerks, accountants and bankers;" so it appears they, at any rate, have abandoned the old employment of their caste; also "the Nadeya Sonars, driven from their homes by the Mahrattas, crossed the Ganges and settled in Dacca. The patronymics of this caste are Sil, Pal, Sena, Maulika, De, &c." But we cannot draw any inferences from the numbers of these names in Dacca to-day, as they are also patronymics of other castes. Dr. Wise continues: "While the *tik-sal* or mint was opened in Dacca, the Nadeya Sonars worked as *son-dhoas*, gold-washers . . . , but since its closure (about a century ago) they have worked as *son-dhoas* on their own account."

There is in Dacca no definite caste of gold and silver workers: any one who cares to learn may ply the trade. At one time it would appear the industry was in the hands of the Swarna Banik caste, but now the Karmokars are the leaders in Dacca, and we find Dhobees, Napits, Kumars, a Bysak even, as well as Mussalmans engaged in it. This lack of exclusiveness has impoverished the artisans by removing all restrictions on competition, and as a class the gold and silver workers of Dacca to-day are poor and ignorant men. There are no real big men in the trade. But it appears that in the old days, whenever they were, the goldsmith was a rich man, fattening on the patronage of the local zamindars. Such an environment usually favours artistic progress, but it did not do so in Dacca either for the muslin or for the metals. In both we see that technical skill formerly reached a high point of excellence, but in the matter of ideas Dacca artisans have always been pious conservatives. It is astonishing how few changes we can trace. Some kinds of dishes that were once made of hammered work

are now made of filigree. We can see considerable improvement in the embossed work, but the filigree of to-day is not so good as the old filigree. Enamelling is growing in popularity, and in place of the crude attempts of former days we find some quite good enamel turned out now.

The Dacca smith is a clever workman. Many of the best craftsmen in the big Calcutta jewellers' workshops were born on the banks of the Booriganga.

While it cannot be denied that the Dacca smith seldom or never turns out a thoroughly well-finished piece of original work, it must in fairness be conceded that he can copy even an intricate pattern wonderfully well.

On the occasion of a procession much gold and silver work sees the light of day. We have a silver *howdah*, silver and gold *chowkees*, silver and gold embroidered trappings for elephants and horses, and many another structure. For these purposes filigree work is obviously unsuitable, as the aim of such things is striking and often garish effect—a thing rather beyond the scope of filigree work.

The most interesting branch of Dacca silver work is undoubtedly the filigree, and this is the branch of it which is known best out of Dacca. In the possession of the Dacca Nawab are large models of his various palaces, made by one Ananda Hari Rai, who is the best living filigree worker in Dacca. The same man also made two filigree elephants which went to Delhi on exhibition. Except for small ornaments, however, which are made very beautifully by some men, the finish of modern Dacca filigree will not compare for a moment with, say, Cuttack work. The commonest products of the filigree industry are ornaments and dishes, especially dishes to hold *attar*. These last are made like a bunch of flowers with the dish concealed in the middle; and this fundamental idea is embodied in many variations. The decay of filigree work is attributed to the lack of demand. But perhaps the real reason is lack of initiative on the part of the artisans. Popular taste being changeable, they ought to produce novelties and try to tempt the market. But they obstinately repeat the old ideas, the old patterns, and wait for commissions which come in ever-dwindling numbers.

Of the gold work there is little to say. Stone-setting and ring-carving are well done. The commonest products of the industry are rings, bracelets, earrings and other female gewgaws. There is nothing save some occasional striking piece of work that attracts special attention.

The numbers employed in the gold and silver work show that the industry is a flourishing one. In Dacca district the last census shows that well over 6,000 people earn their livelihood in this way—a number much greater than formerly. In Dacca City over 800 men are so employed, whereas in Dr. Taylor's time the number was 360. The great bulk of these 6,000 workers make only simple ornaments and utensils; in Dacca City alone is any fine work attempted. Thus the average earnings are small—some Rs. 15 to Rs. 20 a month. No profit is made on the metal, and the rate for simple silver work is three or four annas per tola. Of course for fine work as much as Re. 1-8 may be charged. The cost of working gold varies from Rs. 2 per tola upwards.

As an industry, gold and silver working in Dacca is anything but moribund, but it shows many signs of artistic decadence. Dacca smiths will not speculate, nor do they even try to secure a market by careful attention to orders. It is but few of them who have any stock to show, and even those few have very little. There is a considerable export of Dacca silver to other parts of India. Dacca-made silver *hookahs* are held in high repute, but the export of general work is probably not very great; for while we must make some distinction in favour of the goldsmiths, we can nevertheless generalize so far as to say that Dacca gold and silver work is inferior to that of many other places in finish and originality of ideas.

Murshidabad District.

Murshidabad was never famous for gold and silverware. In Muhammadan times, Dacca usurped for itself all honour in this respect. Whatever prosperity the industry enjoyed in former times is no longer increasing, and on the whole it is waning. The decay of the nobility and the migration of the people to healthier districts on account of malaria have served to discourage the craft.

Classes carrying on these Industries.—The main classes of people who carry on these industries are the Sarnakars and the Subarnabaniks.

Their Number.—The actual workers in this district number 106 only.

Their Social Position.—Generally the people who are engaged in these industries do not pretend to much respectability in society. Their social position is low. None of the higher castes will take water from them, while they take water and sweetmeats from any one except the very lowest classes.

Their Industrial Position.—The industrial position of the gold and silversmiths in this district is not very satisfactory. The masters of the workshops are better off than the workmen, and their income ranges from Rs. 40 to Rs. 300 a month. The workmen generally live from hand to mouth. They, however, are generally contended with their earnings and do not try to improve their position. The average income of a workman is from Rs. 7-8 to Rs. 25 a month, according to individual proficiency in the art.

Manner in which Products are disposed of.—Except at Khagra and Kandi, the goldsmiths rarely keep ready-made articles for sale. They execute orders for articles, and sometimes their customers advance the metal for the wares. The wares manufactured are not for export, but for local consumption. Articles are also sold through middlemen in the interior of the district on commission sale from the principal shops. There are some people who buy ware from the shops wholesale and sell them with some profit to themselves.

Centres of the Higher Form of the Industries with Village Industries.—Gold articles are best manufactured at Khagra and at Kandi. In Kandi some of the workmen from Dacca have settled there, and are turning out good ware. The principal shop is that of a Brahmin, a local inhabitant: strange to say, he is probably the only Brahmin who manages a gold and silversmith's shop.

Silver plate, cups, tumblers, etc., are best manufactured at Kandi. They are not beautifully carved, and in this respect are much inferior to Dacca-made ware. But the shape of the articles manufactured here is more graceful than those of Dacca, imitating as it does the famous brass and bell-metal ware of Khagra.

There are gold and silversmiths' shops at Jiaganj, Murshidabad, Azimganj, etc., but they are not worth mentioning.

Silver *balakata* (a kind of bracelet) is best manufactured at Pulinda in thana Barua in the Sadar subdivision. Silver *mal*, *tabij*, *chhond* (a kind of bracelet) are best made at Bhagirathpore, thana Jallangi, in the Sadar subdivision. The shopkeepers at Khagra and other places buy these ornaments from their manufacturers, and these village industries are famous in this district.

Below is a list of the principal articles turned out :—

Goldware.—(1) Bájoo, (2) Mákri (Jewish pattern), (3) Earrings, (4) Earrings with jhoor, (5) Earrings with stones set, (6) Plain jasham, (7) Star-pattern chain, (8) Star-pattern chain, (9) Star-pattern guard chain, (10) Dará Hár, (11) Tárer Choori, (12) Tárer Choori, (13) Choori with rose leaves, (14) Choori with potato leaves, (15) Chik, (16) Chik, (17) Ananta, (18) Bálá, (19) Bálá, (20) Bálá, (21) Jhoomká, (22) Jhoomká, (23) Hair-flowers, (24) Comb for hair, (25) Bálá, (26) Bálá, (27) Kángni.

Silverware.—(1) Abarjang Mal, (2) Pálang pátá Mal, (3) Pain-jor, (4) Elokeshi Mal, (5) Pán for head, (6) Altágote, (7) Rate, (8) Chandra Hár, (9) Mihi Hár, (10) Khalkhali Mál, (11) Bhágiráthpuri Mál, (12) Goláppásh, (13) Churi, (14) Hair-flower, (15) Tumbler, (16) Farshi, (17) Plate, (18) Báti for hooka, (19) Dibiá for betel, (20) Cup.

Patna District.

At the marriage of a girl gold ornaments form the most costly portion of the paraphernalia and dowry. Gold ornaments are worn by certain classes of men also. Rajputs and Babhans wear gold necklace and armlets. A well-to-do gowala or dhobi wears, as a token of his affluence, gold ear-rings (one on each ear), a gold necklace, or a gold armlet or bracelet on the right arm.

There are certain ornaments, such as anklets with bells, which are not ordinarily made of gold. Vessels are not ordinarily made of gold.

The following is a list of gold ornaments with their weights and values:—

Name of ornament.	Weight.	Value.						
		Rs.	A.	P.		Rs.	A.	P.
Head—								
Mangtika	... 3 tolas	... 84	0	0				
Choti	... 4 „	... 112	0	0				
Tawiz	... 2 „	... 56	0	0				
Jhabea	... 2 to 3 tolas	... 56	0	0	to	84	0	0
Ear—								
Bali	... One weighing 3 mashas	... 7	0	0				
Putta	... „ 4 „	... 9	0	0				
Jhumak	... „ 1 tola	... 28	0	0				
Karanphul	... „ 1 „	... 28	0	0				
Bala	... 3 to 4 masas	... 769	5	4				
Bijuli	... 2 „ 3 tolas	... 84	0	0				
Sikri	... 2 „	... 56	0	0				
Nose—								
Nath	... 6 mashas to 1 tola	... 14	0	0	to	28	0	0
Besar	... 4 to 5 ratti	... 1	8	0				
Neck—								
Hasuli, phonk (hollow)	2 tolas	... 56	0	0				
Panchlari „ „	2 „	... 56	0	0				
Haikal	... One weighing 4 mashas	... 9	5	4				
Jugnoo	... 3 mashas to 1 tola	... 7	0	0	to	28	0	0
Chananhar	... 10 to 16 tolas	... 280	0	0	„	448	0	0
Champakali	... 3 „ 4 „	... 84	0	0	„	112	0	0
Mohanmala	... 1 „ 3 „	... 28	0	0	„	84	0	0
Dalmala	... 10 tolas	... 280	0	0				
Sikri	... 10 „	... 280	0	0				
Satlari	... 4 „	... 112	0	0				
Loin—								
Kamarzeb	... 15 to 16 tolas	... 420	0	0	to	448	0	0
Kamardhani	... One lar (cord) weighing 3 tolas.	... 84	0	0				
Arm—								
Bazoo, phonk (hollow)	... 6 tolas	... 168	0	0				
„ thons (solid)	... 10 to 12 tolas	... 280	0	0	to	336	0	0
Bank	... 4 tolas	... 112	0	0				
Joshan	... 4 „	... 112	0	0				
Naunaga	... 3 „	... 84	0	0				
Hand—								
Shamshabund	... 6 tolas	... 108	0	0				
Alibund	... 4 „	... 112	0	0				
Patri	... 4 „	... 112	0	0				
Kangan	... 12 „	... 336	0	0				
Barhalla	... 4 „	... 112	0	0				
Batana	... One weighing 1 tola	... 28	0	0				
Pahoonchi, phonk (hollow)	5 to 6 tolas	... 140	0	0	to	168	0	0
„ thons (solid)	10 „ 12 „	... 280	0	0	„	336	0	0
Bala, phonk (hollow)	... 1 „ 6 „	... 28	0	0	„	112	0	0
Kara	... 30 „	... 840	0	0				
Finger—								
Arsi	... 1 tola	... 28	0	0				
Anguthee	... 3 to 4 mashas	... 7	0	0				
Chahalla	... 3 „ 4 „	... 7	0	0	to	9	0	0
Angushtana	... 6 mashas	... 14	0	0				
Pore	... 3 to 4 mashas	... 7	0	0	to	9	0	0
Feet—								
Kara	... 30 to 60 tolas	... 840	0	0	to	1,680	0	0
Chahara	... One weighing 3 to 4 tolas	84	0	0	„	112	0	0
Pazeb	... 30 to 50 tolas	... 840	0	0	„	1,400	0	0
Ghungroo	... 3 mashas each	... 7	0	0				
	Total.	... 7,687	2	8	to	9,686	0	0

Silver ornaments are used by those who cannot afford to wear gold ornaments. Among the respectable classes, ornaments worn on the ears, the nose and the forehead are never made of silver.

The following is a list of silver ornaments with their weights and values:—

Name of ornament.	Weight.	Value.					
		Rs.	A.	P.		Rs.	A. P.
Head—							
Mangtika	... Rs. 4 to Rs. 5 bhari ...	3	12	0	to	4	11 0*
Chonti	... „ 4 „ „ 5 „ ..	3	12	0	„	4	11 0
Tawiz	... Each bead at annas 4 bhari	0	3	3			
Jhabea	... 1 bhari ...	0	15	0			
Ear—							
Bali	... 1 bhari ...	0	3	3			
Patta	... Annas 4 to 6 bhari ...	0	5	0			
Jhumak	... One pair at Re. 1-4 bhari ...	0	15	0			
Karanphul	... „ „ „ „ 1-8 „ ...	1	6	0			
Bala	... Annas 8 bhari ...	0	7	0			
Bijli	... Rs. 2 „ ...	1	14	0			
Sikri	... „ 2 „ ...	1	14	0			
Neck—							
Hanslee	... Rs. 10 to Rs. 50 bhari	9	6	0	to	46	14 0
Haikhal	... Each bead at annas 8 „ ...	0	7	6			
Jagnoo	... Annas 8 to Re. 1 bhari ...	0	7	6	to	0	15 0
Chananhar	... Rs. 16 to Rs. 30 „ ...	15	0	0	„	23	2 0
Champakali	... „ 4 bhari ...	3	2	6			
Dalmala	... „ 10 to Rs. 20 bhari ...	9	0	0	to	18	0 0
Mohanmala*							
Sikri	... Rs. 12 to Rs. 20 bhari ...	11	0	0	to	18	0 0
Satlari*							
Loin—							
Kamerzeb	... Rs. 16 to Rs. 30 bhari ...	15	0	0	to	28	2 0
Kamardhani	... „ 16 „ „ 30 „ ...	15	0	0	„	28	2 0
Arm—							
Bazoo	... Rs. 16 bhari ...	15	9	0			
Bank	... „ 5 to Rs. 7 bhari ...	4	11	0	to	5	10 0
Joshan	... „ 4 „ „ 5 „ ...	3	12	0	„	4	11 0
Naunaga	... „ 4 „ „ 5 „ ...	3	12	0	„	4	11 0
Shamshabund	... „ 8 bhari ...	7	8	0			
Alibund	... „ 8 „ ...	7	8	0			
Patri	... „ 4 to Rs. 5 bhari ...	3	12	0	to	4	11 0
Kangan	... „ 12 „ „ 25 „ ...	21	4	0	to	23	0 0
Burhalla	... „ 6 „ „ 7 „ ...	5	10	0	„	7	9 0
Batana	... Each at Re. 1 bhari ...	0	15	0			
Pahoonchi	... Rs. 12 to Rs. 20 bhari ...	11	4	0	to	18	12 0
Bala	... „ 10 or „ 12 „ ...	7	6	0	„	11	4 0
Finger—							
Arsi	... Re. 1 bhari ...	0	15	0			
Anguthee	... Annas 8 „ ...	0	7	6			
Chhalla	... „ 8 „ ...	0	7	6			
Angustana	... „ 8 „ ...	0	8	6			
Pore	... „ 6 „ ...	0	5	6½			
Feet—							
Kara	... Rs. 30 to Rs. 60 bhari ...	28	2	0	to	56	4 0
Chahara	... „ 16 „ „ 30 „ ...	15	0	0	„	28	2 0
Pazeb	... „ 30 „ „ 60 „ ...	28	2	0	„	56	4 0
Ghungroo	... Each bead at annas 6 bhari	0	3	9	„	0	5 4½
	Total ...	250	11	9½	to	569	3 4½

There are certain vessels and other articles which are made of silver—

Vessels.

Atardan	...	Attar tray.
Gulab-pash	...	Rose water vase or sprinkler.
Pan-dan	...	Pan-box.
Phul-changer	...	Flower vase.
Tusht	...	Tray.
Hukka.		
Thal	...	Hukka-stand.
Sarposh	...	Lid of chilim.
Mahnal	...	Mouth-piece.
Vagaldan	...	Spittoon.

Other articles.

Asa	...	Sceptre.
Sonta	...	Wand.
Bullum	...	Spear.
Pankha	...	Hand-pankha.
Palang	...	Cot.
Chauki	...	A small plank.
Machia	...	A stool with back
Kursee	...	Chair.
Howdah	...	Howdah.
Ornaments for horses.		
Ditto for elephants.		

* These ornaments are not generally made of silver.

A silver set, consisting of a *pan*-box, an *attar* tray, a flower-vase, a rose water bottle with a tray, is usually presented as dowry by the middle class, while the more wealthy add to these a horse and an elephant with trappings and ornaments for both, and a silver tamdan or sedan, also silver sceptres, maces, wands and spears.

These articles are borrowed on occasions of weddings for display; and silver chairs, sceptres, maces and wands are kept by Rajas and Nawabs, and are lent by them on occasions of darbars.

The sceptres, wand and spear are carried by *asabardars* (sceptre-bearers) and chobdars when a darbar is held.

Gold and silver ornaments are principally made in the city of Patna, and there are gold and silversmiths in the mufassal towns, and every large village has a goldsmith. All works are executed in this district, but certain ornaments made in Cuttack are also purchased and liked for their design and workmanship.

Monghyr District.

The only place in the district boasting of any special industry in gold and silver is Kharagpur, a small town some 11 miles from the railway station of Bariarpur and 22 miles from Monghyr.

Any exact record of the advent of the jewellers to this locality it is impossible to obtain; but it is probable that their arrival dates from the beginning of the eighteenth century, and their continued existence is doubtless due to the patronage of the original Maharajas.

Of the two hundred souls now in the town, about one-sixth are actively engaged in the trade, out of which they make only a moderate living. That their profit is small may be concluded from the migration of several of the younger men to larger towns, where their skill is better appreciated and more liberally recompensed.

The majority of the jewels now made are bracelets, anklets with innumerable pear-shaped bells that tinkle musically, necklaces, earrings, belts and ornaments for the hair and forehead. A favourite means of enhancing the effect of the ornaments is to insert small cubes of gold and silver in the design. The surfaces of these cubes are brightly polished to resemble precious stones, and have an altogether dazzling effect when seen in the mass. Another equally common trick is to intersperse the jewel with small pellets of burnished silver. *Atardans* are also made.

But the thing for which Kharagpur is most famous is the gold and silver fish with a small cavity between the head and the body used for storing perfumes. Large specimens of these fish are also occasionally used as caskets to present illuminated addresses in. The chief peculiarities of the fish are their extreme lightness and flexibility. The body consists of thinly beaten-out ovals overlapping each other. One edge of the oval is scalloped to resemble the scales of a fish, the plain half being hidden by the scalloped edge of the succeeding ellipse. These are loosely fitted on to each other and are kept together by fine wires running from the neck to the tail of the fish. As alternate scales are gold-washed, the combined effect of the gold and silver scales flashing in the sunlight is very pretty. The fish is usually built up from the tail, each successive ring being bigger than the last, till the required length is attained, and the head is then fastened to the last ring by two small hinges.

CHAPTER VI.—THE GOLDSMITH'S ART UNDER NATIVE AND BRITISH RULE.

Different Styles in Indian Art and Result of European Influence.—Several distinct styles have contributed to the development of the decorative arts in India. There have been, for instance, besides the Aryan floral and animal forms, the fantastic forms of the Indo-Chinese immigrants into Eastern India, the archaic forms of the aboriginal races, and the Saracenic and Persian forms introduced by the Afghan and Mogul conquerers. But all these different styles have assumed a distinctive Indian expression. Now, however, under the influence of European society and the influx of machine-made articles of Birmingham and London, foreign forms of ornament are being introduced into

the country. Vases, trays, tea-pots and other articles for a drawing-room bric-a-brac are being produced by Indian gold and silversmiths, but they limp a long way behind the possibilities of the case. Such articles often betray a confusion of principles and a mongrel style which is an offence against good taste. In persuading them to fashion their goods to European uses, it may be well to allow Indian workmen to adhere to their own schemes of ornamentation. The Indian artizans have indeed a great genius for imitation. The trade in Cashmere shawls has suffered seriously by the quickness with which the Srinagar weavers have adopted the "improved patterns" set before them by the French agents of some Paris import houses. Again, in India, everything is hand-wrought The greatest mistake the native gold and silversmiths can probably make is to try and copy the machine-turned articles of Europe. They can no more do it than perhaps any machinery in the world can rival the handiwork in their own special line. It is for refined public taste to distinguish between what things may be done by machinery and what things must be done by the hand. The following observations of Sir George Birdwood in this connexion are well worth serious attention:—

"The mechanical character of European manufactures requires a consistent general finish, which is quite out of place in the bold and freehand composition of the best native art work, in which finish is strictly subordinated to practical use and artistic effect; and, if a taste for mechanical perfection becomes prevalent with the spread of middle-class English ideas among the Princes and Chiefs of India, Indian wrought arms and jewellery will soon become arts of the past."

The Encouragement of Arts by Native Princes.—The great Native Princes and Chiefs were enthusiastic patrons of the decorative arts, and generally maintained in their palaces a large number of master-workmen. The latter received a salary and daily rations for their lives, and were provided with all the materials for their work. They received a present and an increase of salary for every fine work they produced. It was not only so formerly, but is still the case in India wherever the finest work continues to be produced, as the enamels of Jaipur, the damascened work of Hyderabad, and the shawls of Srinagar. From the *Ayini-Akbari*, or *Institutes of Emperor Akbar* (A. D. 1556—1605), written by Akbar's great minister, Abul Faz, we learn that the Mogul Emperors of Delhi maintained in their palaces skilled workmen from every part of India. It is said that Akbar once a week inspected the work of every artist, when in proportion to their individual merits they were honoured with premiums and their regular salaries were increased. In the workshop of the Imperial wardrobe the weavers and embroiderers of every country were to be found. The skill of the Imperial manufacturers also increased with their number, so that the cloths of Persia, China and Europe became drugs in the market. He had a vast establishment of jewellers, inlayers in gold and silver, damascene workers, enamellers, plain workers in gold and silver, and pierced workers, embossers, makers of gold and silver lace for sword-belts, stone-workers and lapidaries, and other artists.

Influence of British Rule on Art Industries.—But the tendency of British rule is to level down, so that while the lower classes are better off with greater security and an immense development of trade to assist them, the rich luxurious—often the idle—class, the supporters of art industies, is disappearing save in the Native States. In British territory the Court favourites, male and female (the patrons of the goldsmith and jeweller and of the worker in valuable tissues) are nearly extinct, or have little money left for such vanities. Many of the artificers and their descendants are turning to more remunerative employ, often to the railway workshops where the Indian craftsman—in patience, in temper, in delicacy of execution—is found almost without a rival." (*On some Specimens of Indian Metal Works—By J. H. Rivett-Carnac.*)

The native artizans are generally poor and require cash advances to purchase materials. Under the capitalist system of manufacture in Europe, the workmen receive wages, materials and implements from their employers, and turn out articles which it is the latter's lookout to sell where he can. Under the individualist system of production in India the case is entirely different. The workman has generally to procure his own materials, and has himself to sell the things when they are finished. But he is too poor to procure gold and silver and makes things only to order, receiving advances from his customers

for the materials. But to English people accustomed to get ready-made things for cash, the idea of making an advance to a poor native goldsmith is extremely repugnant. This is one important reason why our gold and silversmiths fail to secure orders from Europeans.

CHAPTER VII.—CONCLUSION : INDIAN *vs.* EUROPEAN JEWELLERY.

"New Jewellery" in Europe and the Traditional Industry in India.—Jewellery in Europe has entered upon a new era since the discovery of the diamond mines in South Africa. Diamonds are no longer the choice jewels of a privileged few: they are within the reach of moderate fortunes. As they fell in value and lost the prestige which made them an attribute of wealth, aristocratic taste gave a preference to trinkets which derived their value and character from artistic design. The neglect of the jems for their own sake is the note of the "New Jewellery" in Europe. The jeweller's art no longer lies in the mounting and setting of gems, displaying them to the best advantage. The craft has been revolutionised, and simple ornaments of gold and silver have been revived. Jewellery has risen from an industry to a high class art. But in India there is no spontaniety of inspiration and no true creation as in Europe, especially in recent times. The workmen seldom rise above the crystallised traditions of their craft. But they have inherited a system of forms and patterns based on perfect principles which they have learnt through centuries of practice to apply with unerring truth. As a layman, however, I naturally speak with extreme diffidence on this difficult question.

Varied Estimates of Indian Jewellery in Europe.—Referring to the celebrity which India has enjoyed from remote antiquity for the excellence of her ornaments, Mr. Maskelyne, in his Report on Jewellery and Precious Stones in the French Exhibition of 1866, says :—

"It is said that even that delicate and most sensitive instrument of touch, the hand of the Hindu, is not sufficiently sensitive for fashioning the finest sorts of Indian filigree, and that children alone are employed in the manipulation of such a spider-web of wire. . . . This elegant primitive form of ornament probably reached its limits for delicacy and design at a very archaic period. . . . . The Hindu artizan of our day inherits the methods and skill he uses by the direct descent of an immemorial tradition. . . . But there are other forms of the goldsmith's art scarcely less venerable than that of filigraves possessed of great native beauty and which also have survived in India through the long roll of centuries, inheritance of families and clans."

But, on the other hand, the jury on jewellery at the Great London Exhibition of 1851 actually wrote of Indian jewellery :—

"It is sufficient to cast a glance on the exhibitions of India, Turkey, Egypt, Tunis, to be convinced that these nations have remained stationary from a very early period of manufacture. Some of them, indeed, develop ideas full of grace and originality, but their productions are always immature and imperfect, and the skill of the workman is called in to make amends for the inadequateness of the manufacturing process."

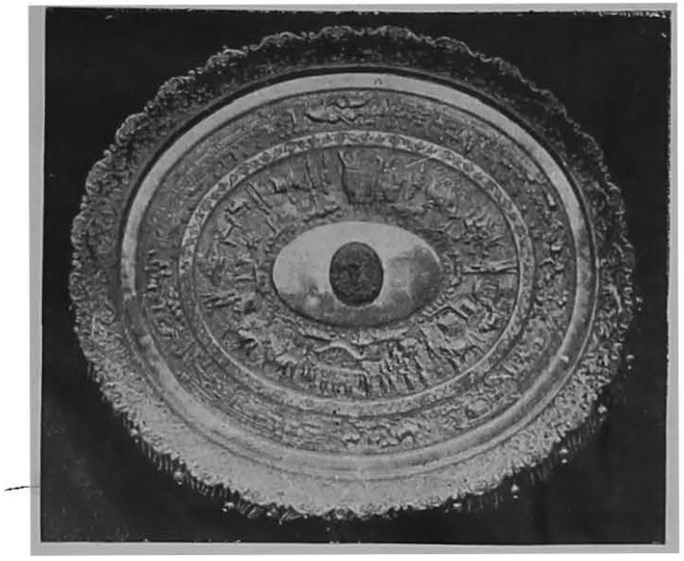
Sir George Birdwood's comments upon this verdict may not be without interest :—

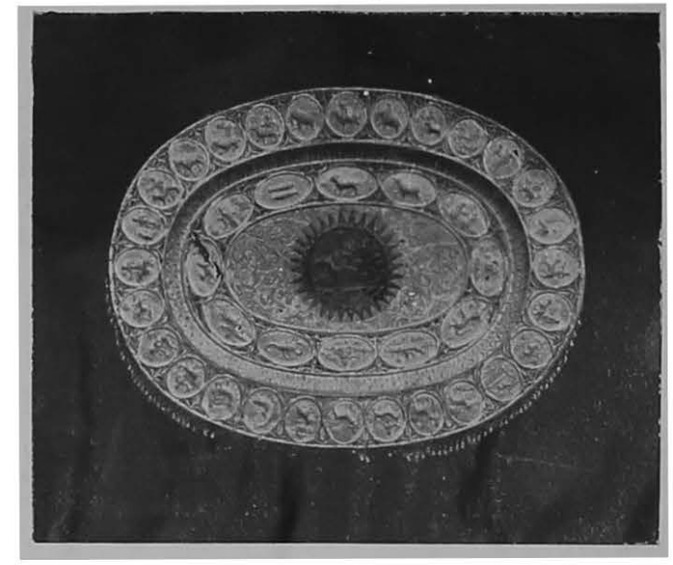
"Surely it is better to remain stationary than to fall, as we have done in England, from the thin, beaten silver of Queen Anne's reign and the designs of Adams, to the present unseemly deadweight silver and gold manufactures of Birmingham and London for which customers have to pay four times more than their value in weight (the cost of Indian jewellery being, on the other hand, from one-twentieth to one-fourth in excess of its net weight). . . . . Nothing can exceed the skill, artistic feeling, and effectiveness with which gems are used in India both in jewellery proper and in the jewelled decorations of arms and plate."

B. S. Press—4047J—500—20-9-1905 - E. J. H.

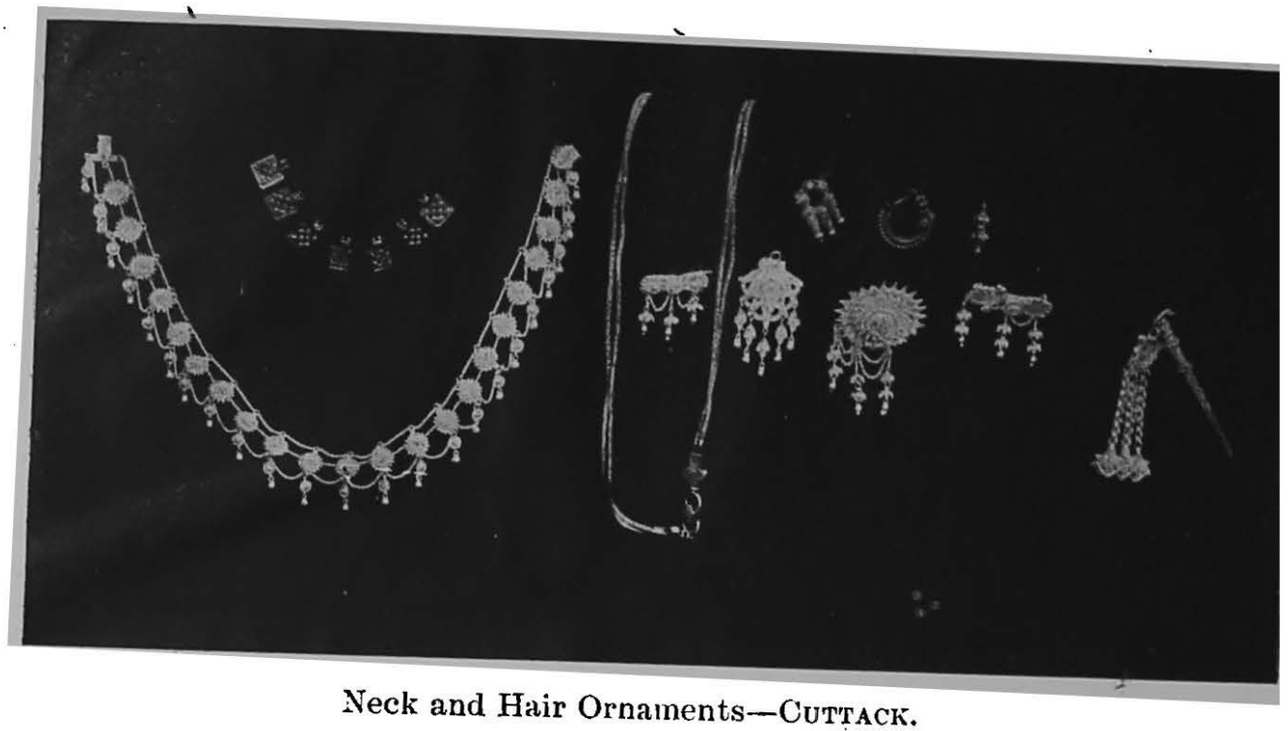




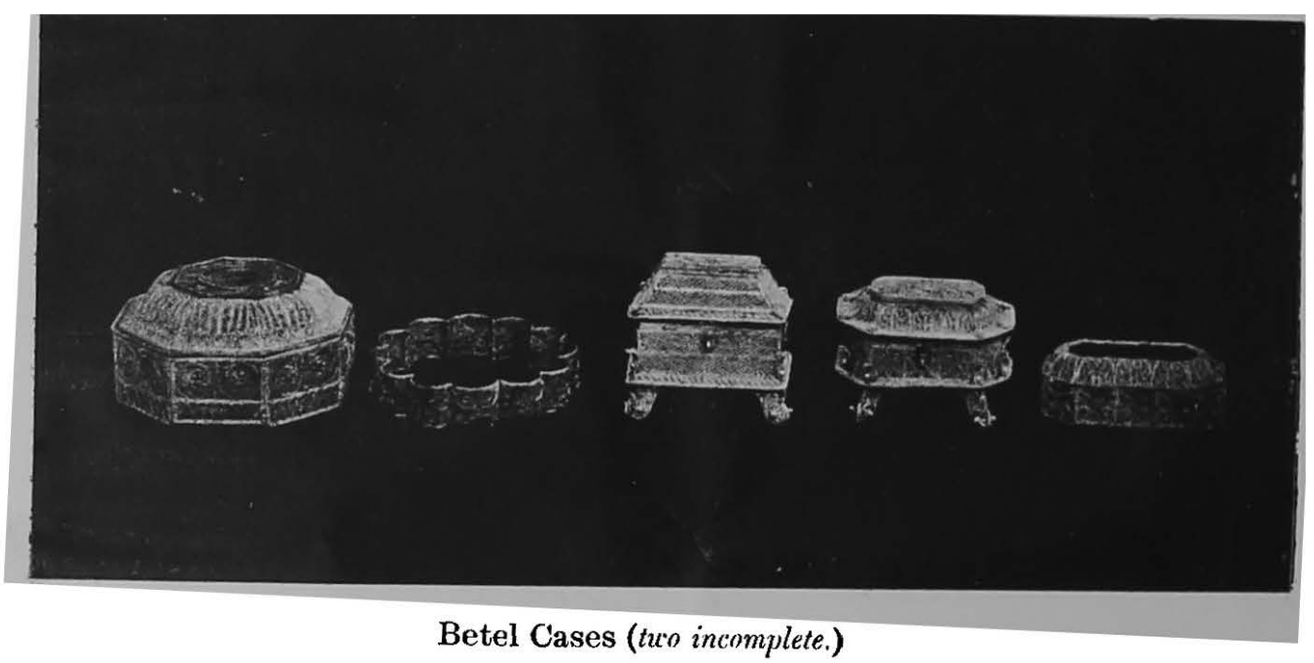




Medallions and Trays, Orissa Art Union, CUTTACK.



Neck and Hair Ornaments—CUTTACK.

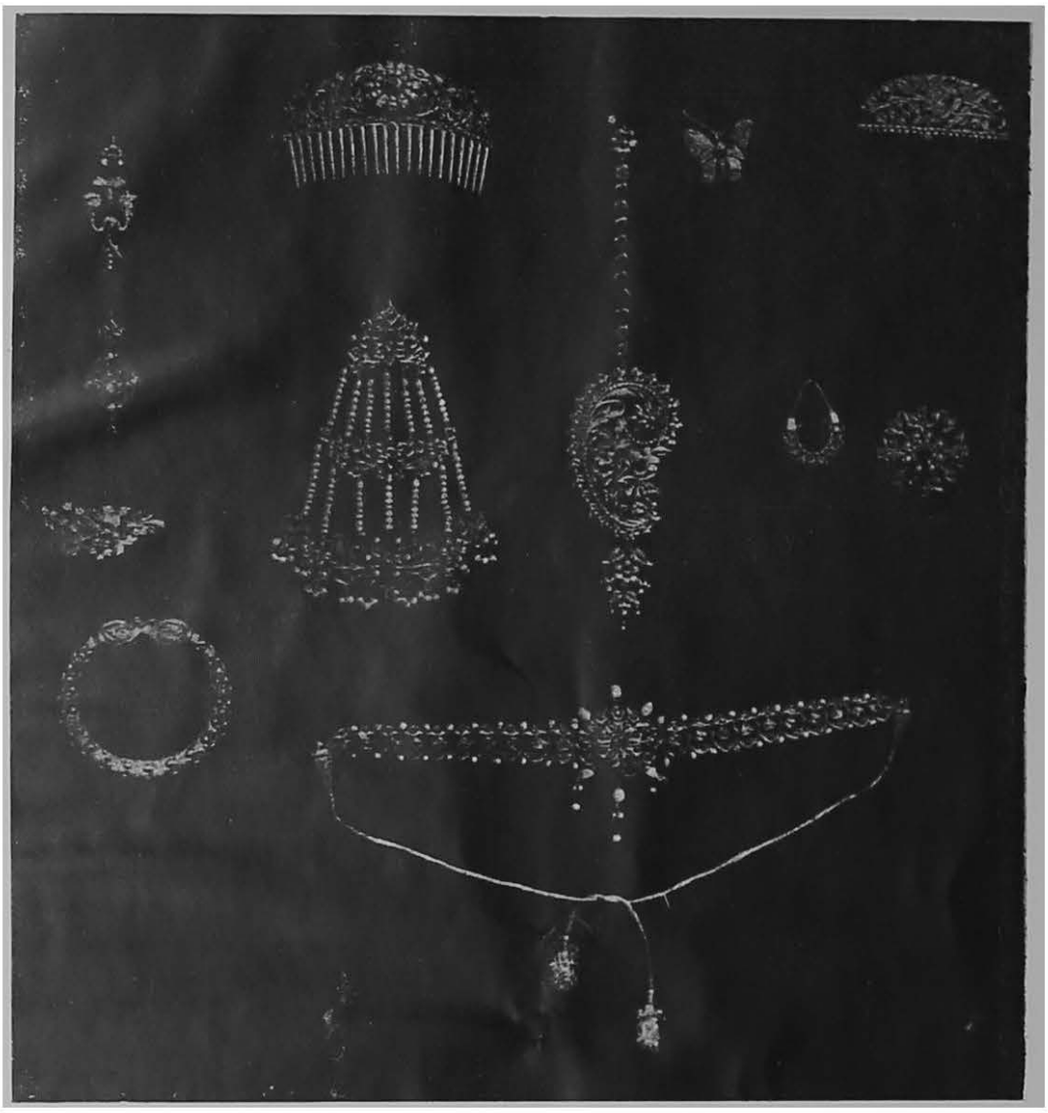


Betel Cases (*two incomplete.*)



Waist Ornaments and Anklets—BENGAL PROPER & ORISSA.

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Gem set Ornaments, CALCUTTA.



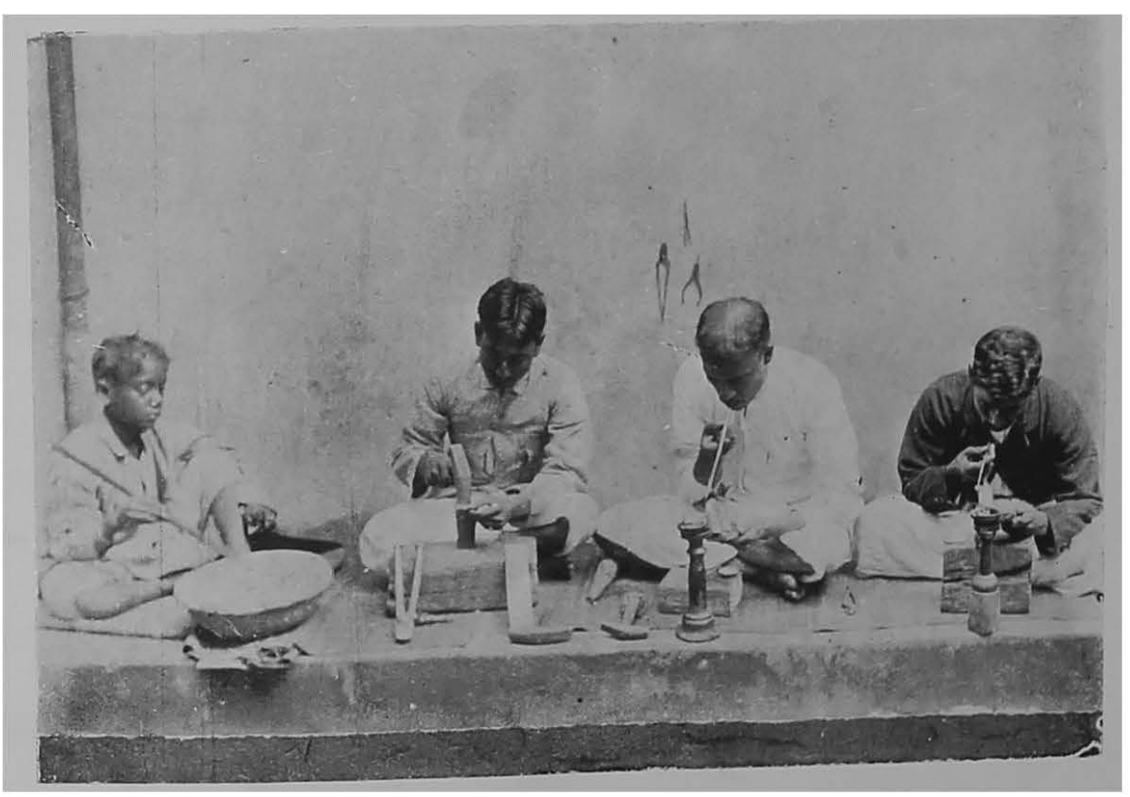
Cup. Tumbler with cover.

Hookah. Match Box. Ink Pot. Vase. Betel-case.



Designer. Repoussé hammering. Transferring design to metal leaf.

CALCUTTA.



Burning. Shape making. Soldering.

CALCUTTA.

Photographed and Engraved by G. N. Mukherji & Bros. Printed at the Mohila Press, Calcutta.

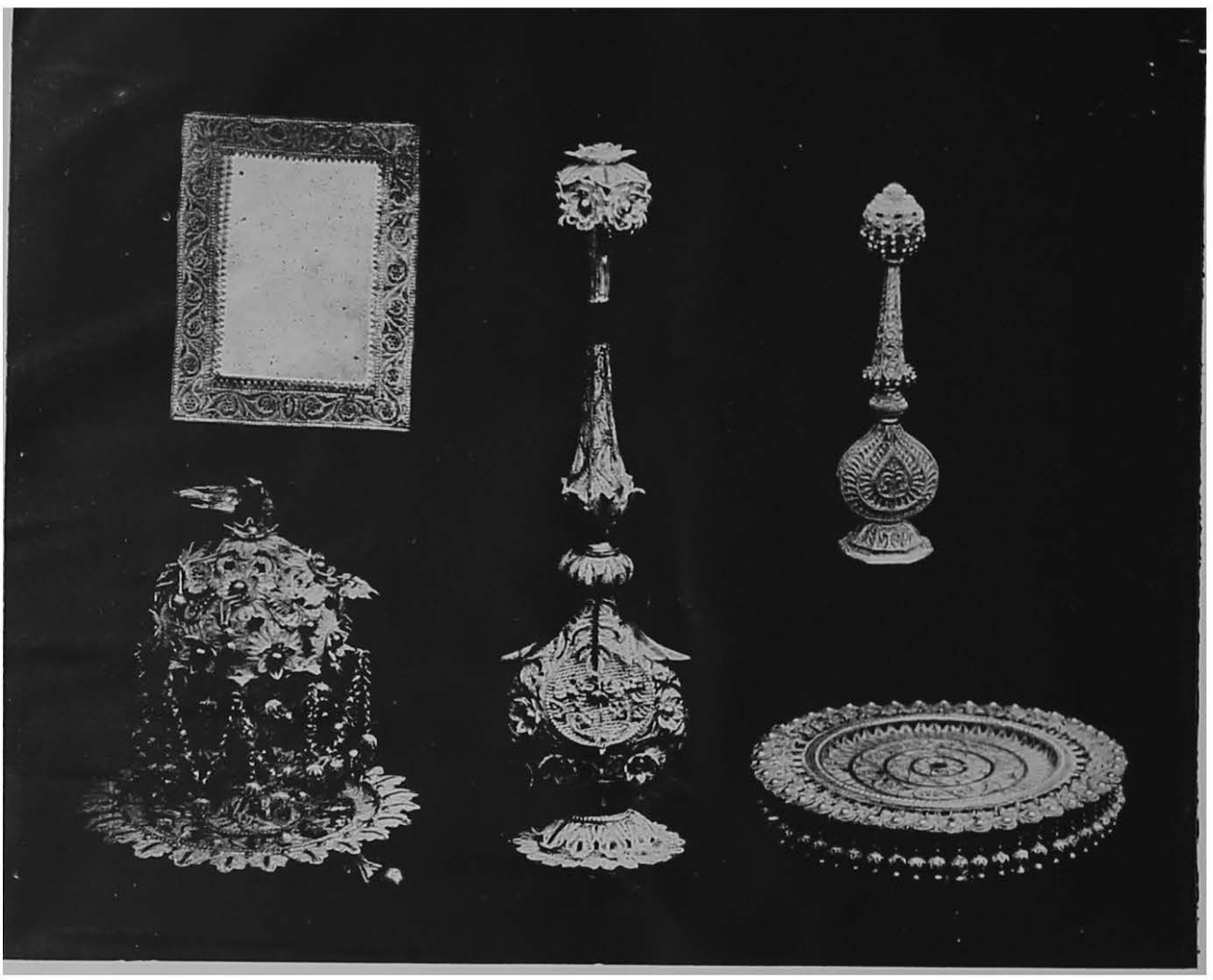
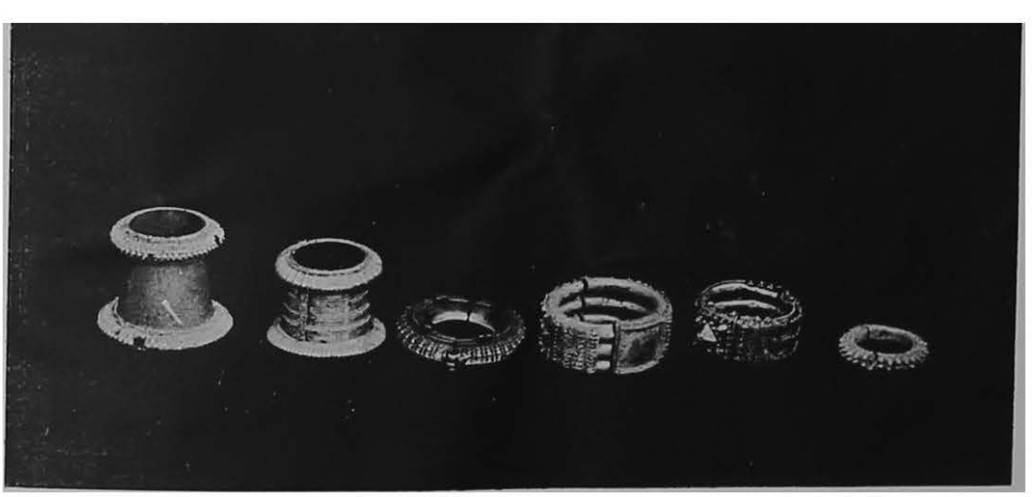


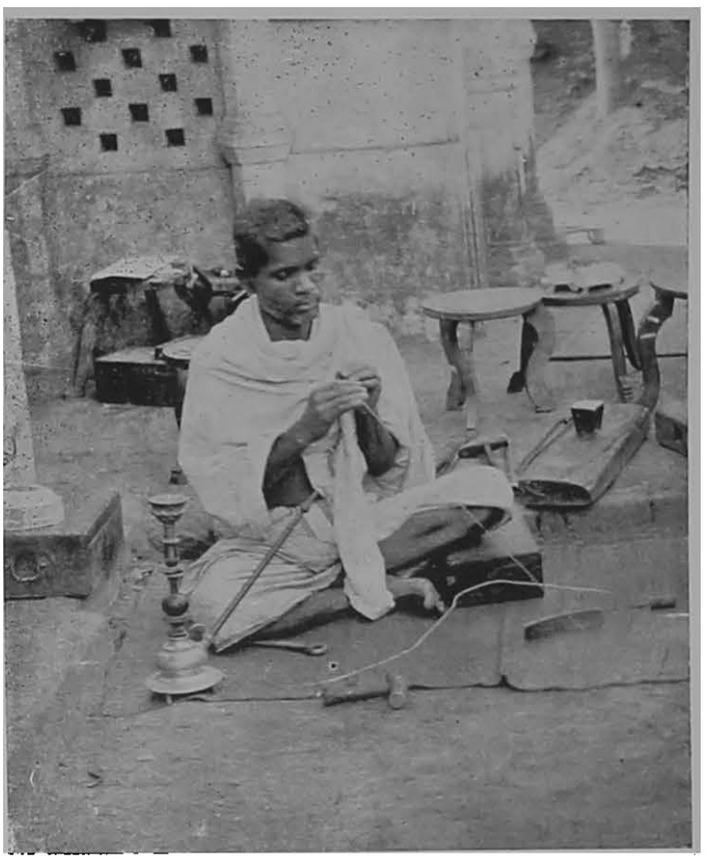
Photo-frame
Atar-dan. (*Scent-bottle.*)

Golab-pas.
(*Scent-bottle.*)

Golab-pas. (*Scent-bottle.*)
Pan-dan. (*Betel-plate.*)



Common Wrist Ornaments, CUTTACK.

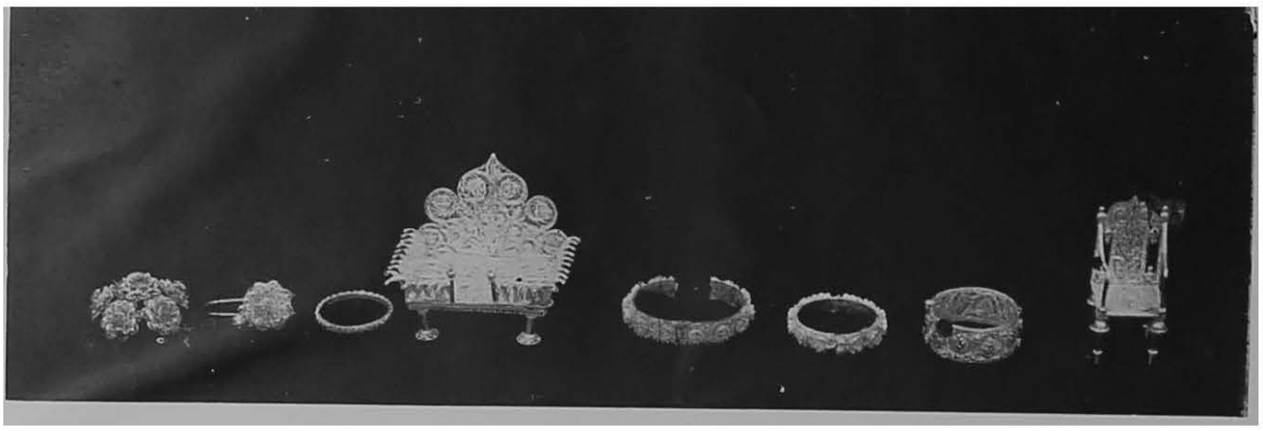


Wire Twisting for Filigree Work—CUTTACK.



Burnishing and Final Cleaning—CUTTACK.

Photographed and Engraved by G. N. Mukherji & Bros. Printed at the Mohila Press, Calcutta.

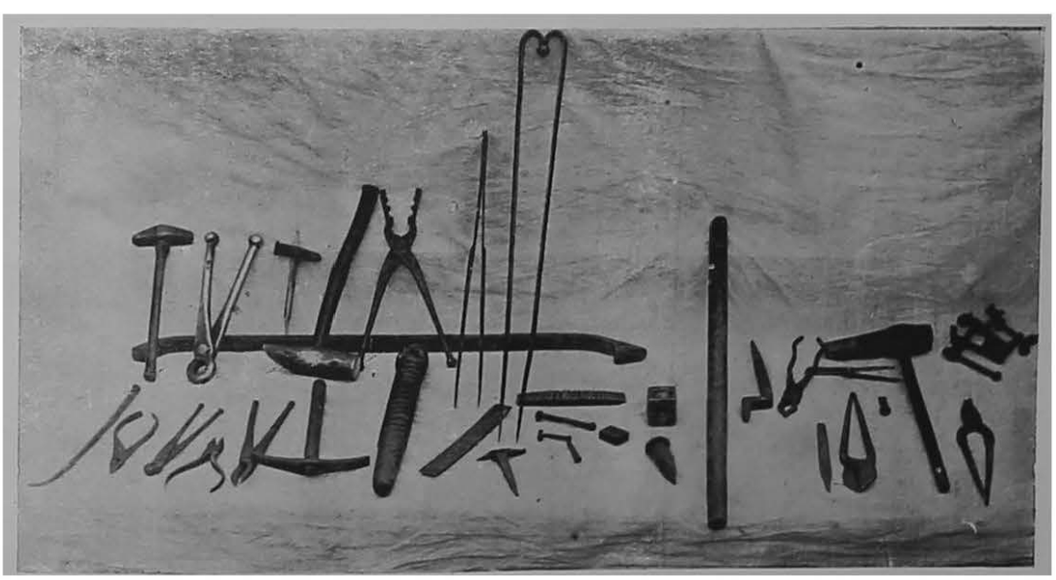


Filigree Toys and Ornaments—CUTTACK.





Goldsmiths at work—CUTTACK.



Goldsmith's Tools.

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